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XIV. *On the Geographical Distribution of the* Meliaceæ. *By* M. Casimir de Candolle, *of Geneva.* (*Communicated by* G. Bentham, *Esq., F.R.S., V.P.L.S.*)

(Tab. & Map=Plates XXX. & XXXI.)

Read April 19th, 1877

Having just completed a revision of the whole order of Meliaceæ, it has occurred to me that a general survey of their geographical distribution would not be devoid of interest. It would certainly be premature to aim at any thing like precise lines of demarcation of the areas of the species themselves in the case of plants so thoroughly exotic, considering that, most likely, a great many new species or new stations of known specific forms remain yet to be discovered. But, on the other hand, we have good reason to suppose that very few genera will have to be added to those already admitted.

When A. de Jussieu, in the year 1830, published his classical monograph of Meliaceæ and Cedrelaceæ, he had to deal with 135 species, which he distributed into 34 genera. At the present time our herbaria contain more than 560 species, forming only 35 genera. It is true that 10 of the generic names originated by Jussieu have been given up since, as founded on insufficient grounds, whilst more modern authors have created as many as 12 new genera. But it is to be remarked that those 12 new genera, taken together, do not include more than 38 distinct species; consequently more than 380 new forms belong to genera already admitted by A. de Jussieu. It is, in particular, worthy of notice that South America, which has been so much explored by modern botanists, has yielded only one new genus of Meliaceæ since A. de Jussieu's time, that genus (*Elhuteria*) being hitherto represented by a single species.

This being the case, it seems that a study of the geographical distribution of the genera of that family is not uncalled for; and I will now proceed to state at once the principal results to which such an investigation has led me.

Nearly all Meliaceæ actually known inhabit the countries situated between the tropics, beyond which their number is found to decrease very rapidly. South of the equator their area seems to be limited to the 30th degree of latitude, the only exceptions that I know of being *Trichilia peruviana*, which has spread as far south as Chile, and *Dysoxylum spectabile*, the single representative of the order in New Zealand on the 40th degree.

In our hemisphere spontaneous Meliaceæ have not hitherto been observed north of the tropics, with the exception, however, of *Cedrela sinensis* and *Aglaia odorata*, which have been collected in the neighbourhood of Pekin, on the 40th degree, and two species of *Melia*, indigenous in the southern part of Japan. Moreover it is well known that *Melia Azedarach*, a plant most likely derived originally from India or Tropical Africa, has from time immemorial been introduced into all countries bordering on the shores of

the Mediterranean, while *Cedrela sinensis* is now cultivated in the open air, in the Jardin des Plantes at Paris.

The existence of these few eccentric stations, in both hemispheres, clearly demonstrates that the fact of the Meliaceæ being confined to intertropical or subtropical regions is not to be accounted for solely by the present climatic conditions, and must, to a great extent, have resulted from other more remote causes of a geological nature. But this is a consideration on which I need not dwell, since it is so thoroughly in accordance with the modern notions of geographical botany.

A general view of the distribution of Meliaceæ is shown in a map (Pl. XXXI.) accompanying this paper, the coloured and shaded portions of which indicate the regions where that order is more or less represented. A dark green line, drawn round the outer extremities of those regions, embraces their whole area, including even such eccentric and exceptional stations as Pekin or New Zealand.

A first inspection of this map would rather lead to considering South America the principal centre of habitation for the Meliaceæ, as they here occupy a larger continuous area than in any other part of the world. But it will presently be shown that the study of the geographical distribution of all the genera composing the family points decidedly to a totally different conclusion.

In order to arrive at a satisfactory conception of the case as it stands, I have drawn up a synoptic Table (Pl. XXX.) of the number of species of each genus in all the countries where Meliaceæ are known to exist.

On the left of the Table is a list of the genera, 35 in number, following each other according to their morphological affinities; whilst in the upper part I have entered the names of all the various countries which are to be taken into account. Those names are written in their geographical order from west to east, beginning with Chile on the left, and ending with the Navigators' archipelago on the right side of the Table.

For the sake of greater precision, the principal provinces of South America are recorded separately one from the other, Africa and Australia being also subdivided into less extensive regions. The western peninsula of India, or India proper, is, for the same reason, kept apart from Birmania and Malacca, which are grouped together with Cochinchina. Finally, more distinct, but relatively small, regions or islands have also been grouped together, such as Columbia with Venezuela, Borneo with Celebes, &c.

Before taking into consideration the contents of the synoptic Table, it is necessary to offer a few remarks concerning the nature of the various genera to which it refers. It will be observed that, with the single exception of *Azadirachta*, A. Juss., all of them have been admitted by Dr. Hooker, in Bentham and Hooker's 'Genera Plantarum,' as well as subsequently by Dr. Hiern, in his important contribution to the flora of British India. On the other hand, in conformity with Miquel's and with Dr. Baillon's views, some few of the generic names contained in the above-mentioned 'Genera Plantarum' have been given up. I have, however, retained the genus *Walsura*, which Dr. Baillon has joined to *Heynea*, and the name *Dysoxylum*, which corresponds to his *Epicharis*. Thus we find that, with very few exceptions, all the genera referred to in my synoptic Table

have, independently of my own researches, and after careful scrutiny, been also admitted by the highest authorities on the subject. Consequently I do not hesitate to consider them as being thoroughly natural.

To return to the figures contained in the Table, it is evident that each of the horizontal series formed by them furnishes us with a complete statistical representation of the geographical distribution of one genus; at the same time a continuous thick, dark line drawn round the extremities of all such horizontal series enables us to understand clearly the relation which exists between that geographical distribution and the morphological affinities of the various genera.

A first result becomes thus manifest. We are at once struck by the fact that the greatest number by far of the genera of Meliaceæ are to be found in the central part of the Table, whilst on the sides there are only a few generic forms presenting but a slight mutual affinity. In other words, we may say that the American and East-Polynesian genera, rare and very distinct, are morphologically connected by a series of numerous intermediate forms, all concentrated in the Asiatic regions or in their neighbouring archipelagoes. It is, for instance, a positive fact, that out of the 35 genera composing the whole order, no less than 26 are represented within the limits of the western coast of India on one side, and of the eastern shore of Australia on the other.

We also observe that, with the exception of *Melia* and *Cedrela*, these various genera are very much localized, the figures corresponding with each of them forming only short horizontal series in the synoptic Table. With respect to the genus *Melia*, its exceptionally large area is more apparent than real, being due, for the most part, to the wide spreading of a single species, namely, *Melia Azedarach*, which is not to be considered indigenous out of Tropical Africa and India. I have consequently left all the other stations of that species outside the continuous line including the genus, which is thus reduced to a very moderate area. The genus *Cedrela*, on the other hand, extends in reality over a vast surface; but it must be observed, at the same time, that there exists a striking morphological difference between the American and Indian or Australian species, a fact which could not, however, be made apparent in the Table.

Another general conclusion to be derived from the synoptic Table is the great analogy which exists between the Polynesian and the Asiatic *Meliaceæ*. In fact, we see that all the Polynesian species, excepting *Vavæa Amicorum*, belong to what may be termed the Indian type of Meliaceæ—that is to say, to genera which are represented in either one or the other of the Indian peninsulas.

With regard to Australia, the case is somewhat different. Besides many species belonging to the Indian type, that continent contains also two genera (*Owenia* and *Lansium*) which belong exclusively to it; and moreover ten out of the eleven species composing the genus *Flindersia* are hitherto known only in Australia. Although the whole tribe of Melieæ, so abundant in Tropical Africa, is entirely missing in South America, there exists, nevertheless, a striking analogy between the types of those two distant continents. Not only are the three genera *Trichilia*, *Carapa*, and even *Guarea* represented in Africa as well as in South America, but, moreover, *Carapa procera* is actually common to the west coast of Africa and the Guianas.

No less remarkable is the total difference existing between all the American Meliaceæ and those of the most eastern parts of Polynesia,—not a single American species, not a single American genus, being hitherto represented further west than the westerly slopes of the Peruvian or Columbian Andes, and all Asiatic genera having, as above mentioned, not been found further east than the Navigators' Islands. It is, however, to be observed that the Brazilian genus *Cabralea* posseses the closest affinities with the genus *Dysoxylum*, which is spread all over Polynesia—a fact which might, perhaps, suggest some amount of analogy between the American and the Indian types; but at the same time it is to be observed that the genus *Cabralea* is exclusively confined within the southern provinces of Brazil, none of its species having hitherto been found on the western side of the Andes.

I pointed out at the beginning of this paper how premature it would be to take into serious consideration the exact boundary-lines of the species of Meliaceæ. Some general remarks, however, bearing on this part of the subject are not altogether out of place. As might have been expected, the insular species are in general very much localized. A striking illustration of this consists in the fact that 18 out of 19 species of *Dysoxylum* inhabiting New Caledonia are special to that island, a single one of them existing also in Australia and in other parts of Polynesia. On the other hand, some species are remarkable for the great extent of their areas. For instance, *Sandoricum indicum*, (*Maingayia*) *marginatum*, and *Chisocheton paucijugum*, which are all of them indigenous in the Malayan peninsula, have also been found in Java, and even as far east as Borneo. Again, *Trichilia havanensis*, *Guarea filiformis*, *G. trichilioides*, *Swietenia Mahagoni*, and *Cedrela Glaziovi* are common to the West Indies and several provinces of South and Central America.

In conclusion, the chief features of the geographical distribution of Meliaceæ may be summed up briefly as follows:—

1. The number and the mutual affinities of the various genera of Meliaceæ are found to decrease gradually from the Asiatic regions towards Africa and America on one side, and towards Eastern Polynesia on the other.

2. There exists a marked analogy between the American and the African Meliaceæ, whilst all the Polynesian species and genera of the order belong to the Indian type.

3. New Caledonia contains a remarkable number of very distinct species, all of which, except one (*Flindersia Fournieri*), belong to the Indian type, though they are exclusively to be found in that island.

4. In Australia we find three Indian genera, *Turræa*, *Dysoxylum*, and *Cedrela*, associated with the three genera *Owenia*, *Synoum*, and *Flindersia*, which, with the exception of a single species (*Flindersia Fournieri*), belong exclusively to that country.

5. No species of Meliaceæ have hitherto been collected in the most eastern islands of Polynesia—that is to say, further east than the Navigators' group. It is, however, hardly credible that the order should be entirely absent from the Sandwich or Galapagos archipelago. Should subsequent explorations reveal the existence of Meliaceæ in those islands, it will be interesting to know whether they belong to the Indian or to the American type.

TABULAR ARRANGEMENT ILLUSTRATING THE GEOGRAPHICAL DISTRIBUTION OF THE GENERA AND SPECIES OF THE MELIACEÆ, ACCORDING TO M. CASIMIR DE CANDOLLE.

		Chile.	Peru.	Columbia and Venezuela.	Panama.	Central America.	Mexico.	Guianas.	Brazil.	West Indies.	West Tropical Africa.	Cape.	East Tropical Africa.	Madagascar and Mayotte.	Bourbon and Mauritius.	India (western peninsula).	Ceylon.	Andaman.	Birmah, Malacca, and Cochin-China.	Sumatra.	Java.	Borneo and Celebes.	China.	Japan.	Philippines and Moluccas.	Timor.	New Guinea.	North Australia.	East Australia.	New Caledonia.	New Zealand.	Fiji.	Navigators' Islands.
MELIEÆ.	Cipadessa													2		1																		
	Quivisia													3	5																			
	Turræa										2	3	3	5		3					3		1						1					
	Turræanthus												2																					
	Naregamia										1					1																		
	Munronia															1	1				1					1								
	Melia	1	1	1	1	1	1		1	1	2	1			1	2	1		2		2			2	2	1			1			1	
	Azadirachta															1					1													
TRICHILIEÆ.	Sandoricum														1				3			5			1									
	Cabralea								30																									
	Dysoxylum															7	1		7	4	18	4			4	3	5	1	9	19	1	1	1
	Chisocheton															1–2			9	2	3	3			2								
	Guarea		10	6		2–3	4	10	43	6	1																							
	Amoora															5	2		8	1	2	2			2	2			1	2				
	Dasycoleum																					2				2								
	Owenia																											1	4					
	Synoum																												2					
	Lansium															1			3		1													
	Beddomea															2																		
	Aglaia														1	6	3	3	11	13	15	9	1	7			2		1	1		1	1
	Hearnia																					4			3									
	Walsura															2	3	4	3															
	Ekebergia										5	2	2																					
	Vavæa																																	
	Trichilia	1	8	14	2	4	8	11	48	15	8	1																					1	
	Heynea													1		1			2	1														
SWIETENIEÆ.	Chukrasia															2			1															
	Khaya										2																							
	Swietenia		1			1	1				1																							
	Elutheria			1																														
	Soymida															1	1																	
	Carapa					1		2	1		2			2	1		1		2		2				2				2	2		2	
CEDRELEÆ.	Flindersia																								1?				9	1				
	Cedrela		1	2			1–2?	1	4	2			1			3	1		1		1		1						1				
	Chloroxylon															1	1																	

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GEOGRAPHICAL DISTRIBUTION OF THE MELIACEÆ

XV. *New British Lichens.* *By the Rev.* W. A. Leighton, *B.A. Camb., F.L.S., F.B.S.Ed., &c.*

(Plate XXXII.)

Read December 7th, 1876.

Lecidea impressula, Leight. *Albido-cinerascent, thin, filmy, rimulose, nigro-limitate.* (K *yellow, then red.*) *Apothecia black, minute, punctiform,* numerous, crowded into small groups of 3 or 4 or more, *impressed or sunken in the thallus, each apothecium circumscissed so as to appear surrounded by a thin thalline margin*; hypothecium thin, nigro-fuscous; paraphyses indistinct, apices colourless; hymenium tinged with brown; *spores* 8, *fuscous, rotundo-oblong,* 1-*septate,* more or less constricted in the middle.

On bluish-grey slates, rare, 1876.

Gelatina hymenea I dirty blue. Spores ·014–·0145 mm. long, ·009 mm. broad. Several plants grow on the same stone, and by the union of their dark hypothalli map out the surface as in *L. geographica.* Allied to *L. stellulata,* Tayl., but distinct by the thin filmy thallus, larger spores (one third larger), and the singularly impressed apothecia.

Llanachar bridge! and Fort Hill!, near Fishguard, Pembrokeshire (1876); Festiniog road, near Dolgelley!, North Wales. Moel-y-gest! near Tremadoc.

Lecidea tephrizans, Leight. *Thallus* nearly *obliterated,* only a few whitish depressed scattered areolæ remaining; (K — C —;) *hypothallus cinerascent, predominating*; *apothecia black,* numerous, plane or slightly concave, *prominent, sessile,* moderate; margin thickish, eventually obliterated; *hypothecium nigro-fuscous, subtended by a pale greyish-blue hyaline excipulum*; *hymenium thin, pale greyish-blue*; paraphyses distinct but cohærent, apices nigro-fuscous; *spores* 8, *colourless, narrowly ellipsoid, simple, minute.*

On hard slaty rocks, rare, 1876.

Spores ·009–·01 mm. long, ·004–·005 mm. broad. Spermatia minute, shortly cylindrical, straight. Gelatina hymenea I dirty blue.

Llanachar bridge! near Fishguard, Pembrokeshire (Sept. 1876).

Lecidea ryssolea, Leight. *Albido-cinerascent, thick, tartareous, diffracto-areolate*; *areolæ* plane or subplano-convex, *irregularly wrinkled,* nigro-limitate. (K yellow, then red.) *Apothecia nigro-fuscous, opake,* somewhat rusty, *large, very prominent* and sessile, numerous, margin thick, paler, entire or flexuose; *hypothecium very thick, fusco-nigricant*; hymenium thin, brownish; paraphyses indistinct, apices thick, nigro-fuscous; *spores* 8, *fuscous, oblong,* 1-*septate, small.*

On Caradoc sandstone rocks, rare, 1876.

Spores ·016–·017 mm. long, ·007–·008 mm. broad. Gelatina hymenea I pale dirty blue. Medulla I—.

Fort Hill! near Fishguard, Pembrokeshire (Sept. 1876).

LECIDEA IMPONENS, Leight. Thallus obsolete; *apothecia black*, minute, numerous, *scattered, sessile*, plane or subconcave, margin thin, eventually obliterated; *pale bluish-cinerascent within*; *hymenium and hypothecium hyaline, pale bluish-cinerascent*; *excipulum horny, bluish-cinerascent, externally darker*; paraphyses thick, cohærent, apices nigricant; *spores* 8, *colourless, elliptical*, simple.

Parasitic on *Lecanora polytropa* (Ehrh.), rare, 1876.

Spores ·014–·015 mm. long, ·0055 mm. broad. Gelatina hymenea I dirty fuscescent.

Fort Hill! near Fishguard, Pembrokeshire (Sept. 1876).

LECIDEA GLAUCOMARIA, Nyl. Thallus obsolete, merely a small irregular, deformed, pale nigro-fuscous patch or discoloration, on which are the apothecia; *apothecia fusco-nigrous*, opake, clustered, *subinnato-sessile, plane, margin thickish, paler, entire, often subflexuose*; hymenium fuscescent; paraphyses indistinct, cohærent, apices incrassate, fusco-nigricant; *hypothecium nigro-fuscous, thin*; *spores* 8, *colourless, oblongo-ovoid*, 3-*septate*.

Parasitic on *Lecanora glaucoma* (Hoffm.), rare, 1876.

"Gelatina hymenea I pale blue, then vinous red. Spores ·021–·025 mm. long, ·008–·009 mm. broad" (*Nyl. Obs. Holm.* 177, fig. 10; *Scand.* 245). The apothecia sometimes form warty agglomerations. Spores ·0235 mm. long, ·009 mm. broad.

Not to be confounded with *Arthonia glaucomaria*, Nyl. (*A. varians*, Dav.), which grows on the apothecia (not on the thallus) of *Lecanora glaucoma* (Hoffm.). This lichen has been found sparingly in France and at Stockholm, but has been now detected for the first time in Great Britain.

Goodwick Bay! Pembrokeshire (Sept. 1876).

LECIDEA PARELLARIA, Nyl. (*in Flora*, 1876, p. 239). Thallus none; *apothecia black*, opake, small, scattered, single or 2 or 3 together, *sessile chiefly but not exclusively in or near the margins of the areolæ of the matrix*; *thallus* plane, *margin thickish, prominent, more or less pruinose*; *hypothecium nigro-fuscous, thin*; paraphyses indistinct, conglutinate, apices clavate, nigricant; *spores* 8, *fuscous, lineari-oblong or oblong, generally* 1-*septate, sometimes* 2-*septate, and sometimes* 3-*septate* in the same apothecium; gelatina hymenea I bluish, then fuscescent.

Parasitic on *Lecanora parella* (L.), rare, 1876.

Spores ·011–·014 mm. long, ·005 mm. broad. This interesting lichen has been found once in the West of Ireland, by Mr. Larbalestier in 1876; and it now occurs very plentifully on stone walls about Fishguard, Pembrokeshire (Sept. 1876).

LECIDEA ENDOMELÆNA, Leight. *Pale cinereo-virescent*, opake, *glebulose*; *glebulæ scattered or areolato-diffract, thick, convex, composed of minute conglomerate convex, roundish, or sublobate subfurfuraceous squamules.* (K pale yellow, C pale yellow.) *Apothecia violet-black*, rather *large, innato-sessile*, at first plane with a thickish margin, afterwards very convex and immarginate, *slightly pruinose, concolorous within*; *hypothecium very thick, nigro-fuscous, with a paler brown enclosed intermediate stratum*; *spores* 8, colourless, small, *elongato-ellipsoid*, simple.

On stone walls, very rare, 1874.

A very distinct species. Hymenium palish blue, I dense violet. Paraphyses cohærent, apices fuscous. Spores ·0115–·0125 mm. long, ·0045–·005 mm. broad.

ODONTOTREMA MAJUS, Leight. Whitish or evanescent; *apothecia brownish, prominent, scattered, rotundate, suburceolate*; *margin thickish, prominent, persistent, nearly entire*; hypothecium colourless or slightly fulvescent; paraphyses distinct, slender; *spores* 8, colourless, *broadly lineari-oblong*, 3-septate.

On drift wood and decorticated stumps, rare, 1876.

I renders the linear asci and spores lutescent. Spores double the size of those of *O. minus*, Nyl., ·019–·021 mm. long, ·0075–·0085 mm. broad. Spermogonia brownish, oblong, minute; spermatia oblong or lineari-oblong, ·0095 mm. long, ·003 mm. broad.

This I possess amongst the Arctic American lichens of Sir John Richardson; and now (Sept. 1876) it has occurred on drift wood in Goodwick Bay, Pembrokeshire. It has also been detected on old willow stumps at Hencote Pool, near Shrewsbury, and on wood chips in Gloucestershire.

Spores of *O. minus*, Nyl. (see fig. 15), ·0115–·014 mm. long, ·005 mm. broad. Spores of *O. longius*, Nyl. (see fig. 17), ·0195–·021 mm. long, ·005–·007 mm. broad.

VERRUCARIA NEOTTIZANS, Leight. *Apothecia black*, minute, *clustered*, hemisphærico-conical; *perithecium* carbonaceous, *entire*; paraphyses distinct, slender; *spores* 4, *fuscous, lineari-oblong*, 3-*septate, constricted.*

Parasitic on the thallus of *Bæomyces rufus*, DC., very rare, 1876.

Gelatina hymenea I—. Spores ·0245–·025 mm. long, ·0085–·009 mm. broad.

Llanachar bridge! near Fishguard, Pembrokeshire (Sept. 1876).

VERRUCARIA FUMOSARIA, Leight. *Apothecia black*, minute, *hemisphærico-depressed, semi-immersed*; epithecium poriform; *perithecium dimidiate, much incurved at the base*; paraphyses none; *spores* 8, *fuscous, broadly or rotundo-oblong*, 1-*septate.*

Parasitic on the thallus of *Lecidea fuscoatra*, f. *fumosa*, Ach., rare, 1876.

Spores ·0155–·016 mm. long, ·007 mm. broad.

Pen Cow! near Fishguard, Pembrokshire (Sept. 1876).

VERRUCARIA PERTENUIS, Leight. *Cinereo-nigricant, thin, filmy, continuous*, opake, *furfuraceous*; *apothecia black*, opake, *minute*, numerous, *hemisphærical, sessile*;

perithecium dimidiate, black; epithecium a minute pore; paraphyses distinct, long, thickish; *spores* 8, *colourless*, *elongato-acicular*, *slender*, 3-*septate*.

On slaty rocks, rare, 1876.

Differing altogether from *V. chlorotica* (Ach.) in the attenuated acicular spores and other characters, as above. Gelatina hymenea I lutescent, especially asci and spores. Spores ·034–·035 mm. long, ·004 mm. broad. Spermogonia numerous, minute, verrucarioid; spermatia excessively minute, oblong or lineari-oblong, straight.

Goodwick Bay! Pembrokeshire (Sept. 1876).

DESCRIPTION OF PLATE XXXII.

Fig. 1. *Lecidea impressula*. Vertical section of an apothecium, enlarged.
Fig. 2. Spores, magnified 1200 times.
Fig. 3. Vertical section of the enlarged apothecium of *Lecidea tephrizans*.
Fig. 4. Spores of *L. tephrizans*, magnified 1200 times.
Fig. 5. *Lecidea ryssolea*, apothecium in vertical section, enlarged.
Fig. 6. Spores of same, magnified 1200 times.
Fig. 7. The enlarged apothecium of *L. imponens*, in vertical section.
Fig. 8. Spores of *L. imponens*, magnified 1200 times.
Fig. 9. *Lecidea glaucomaria*, vertical section of enlarged apothecium.
Fig. 10. Spore of same lichen, magnified 1200 times.
Fig. 11. *L. parellaria*, enlarged apothecium in vertical section.
Fig. 12. Spores of *L. parellaria*, magnified 1200 times.
Fig. 13. *Lecidea endomelæna*. Apothecium in vertical section, enlarged.
Fig. 14. Its spores, magnified 1200 times.
Fig. 15. Spores of *Odontotrema minus*, magnified 1200 times.
Fig. 16. Spores of *O. majus*, magnified 1200 times.
Fig. 17. Spores of *O. longius*, also magnified 1200 times.
Fig. 18. Spores of *Verrucaria neottizans*, magnified 1200 times.
Fig. 19. Spores of *V. fumosaria*, magnified 1200 times.
Fig. 20. Spores of *V. pertenuis*, magnified 1200 times.

D.Blair lith.

NEW BRITISH LICHENS.

M.&N.Hanhart imp

XVI. *New Irish Lichens.* *By the Rev.* W. A. Leighton, *B.A.Camb., F.L.S., F.B.S.Ed., &c.*

(Plate XXXIII.)

Read April 5th, 1877.

Pertusaria incarnata, Leight. Thallus *creamy-white*, thin, tartareous, effuse, *smooth, plane, minutely rimuloso-diffract.* (K — C —.) *Apothecia single, of a waxy appearance, paler than the thallus, prominent*, sessile, *depresso-globose*, variable in size according to age, in maturity large; *ostiolum yellowish flesh-colour, lecanoroid*, at first small and round, poriform, eventually *dilated and urceolate, surrounded by a broad, thick, pale, waxy, thalline margin*; hymenium in section ceraceo-gelatinose, flesh-coloured; paraphyses slender, more or less branched and entangled, apices colourless; *spores* 2, colourless, *very large, lineari-oblong or ellipsoid, simple, with a very narrow limb or epispore.*

On granite rocks, very rare, Kylemore, co. Galway, Ireland, *Mr. Larbalestier* (1875).

Spores ·062–·067 mm. long, ·033–·035 mm. broad. Gelatina hymenea I violet.

This beautiful lichen is excessively rare, and apparently quite new to science. It has occurred only once to Mr. Larbalestier, whose indefatigable and skilful lichenological researches in the west of Ireland have added so many and such rare novelties to our lichen-flora. In general external aspect it a good deal resembles *Lecanora epulotica*, Ach., for which it might cursorily be readily mistaken; but the number, size, and shape of the spores and other characters keep them abundantly apart. It seems allied to *Pertusaria rhodoleuca*, Th. Fries; but that species is at once distinguished by its 8 smaller spores. *Pertusaria rhodocarpa* of Garovaglio's 'Comment. de Pertusariis Europ. Med.' p. 8, t. iv. f. 4, is like it in the large size and narrowly limbed two spores, but differs in growing on mosses, and having a verrucoso-granulose thallus and coacervate aggregate numerous apothecia. Garovaglio's plant, which he refers doubtfully to *P. rhodocarpa*, Krbr. (Syst. p. 384), cannot be identical with that German lichen, inasmuch as Th. Fries, who has examined an original specimen from Körber, 'in Lich. Scand.' p. 322, refers Körber's lichen to *Varicellaria rhodocarpa*, Th. Fr., which has an immense single 1-septate spore, and is represented in Th. Fr. L. Scand. Exs. 73! and has reaction K—, C crimson, and is altogether different in its sorediate thallus.

Lecidea polospora, Leight. Thallus *white or albo-glaucous*, very thin and filmy, effuse, smooth, and somewhat shining, unequal or rugulose (K— C—); *apothecia black, minute*, scattered, *adnate*, plane, with a narrow slightly prominent margin, at length plano-convex and immarginate; *hypothecium nigro-fuscous*; hymenium

colourless; paraphyses distinct, thickish, apices globular, nigro-fuscous; *spores* 8, *elliptical, fuscous, with a paler fuscous roundish cell at each apex.*

On old thorn-bushes, very rare. Ballinahinch churchyard, co. Galway, Ireland, *Mr. Larbalestier* (1877).

Much resembling in general aspect *Lecidea myriocarpa*, DC. Gelatina hymenea I deep blue. Spores ·02–·022 mm. long, ·009 mm. broad. The peculiar shape and structure of the spores keep it as an entirely distinct species.

Lecidea grumosa, Leight. Thallus *evanescent*; *apothecia rufo-fuscescent, minute*, scattered, *adnato-sessile, plano-convex*, the slight margin soon obliterated; *hypothecium colourless*; *hymenium yellow, grumous*; *paraphyses altogether indistinct*, apices colourless; *spores* 8, in lineari-obovate asci, *colourless*, oblong, *simple, filled with very minute spherical granules.*

On pine-bark, rare. Ballinahinch, co. Galway, Ireland, *Mr. Larbalestier* (1877).

A very singular species. Gelatina hymenea I blue, then fulvescent. Spores ·013–·015 mm. long, ·007–·009 mm. broad.

Lecidea antrophila, Larbal. Thallus *ochraceo-virescent*, thin, effuse, *pulverulento-furfuraceous* (K— C —); *apothecia fulvo-rufescent*, small, scattered, *excessively convex* and prominent, sessile, *immarginate, a very pale narrow margin only appearing when wetted*; *hypothecium darkly fulvo-rufescent*, thick; hymenium colourless; *paraphyses indistinct, apices colourless*; *spores* 8, *colourless, linear, or lineari-oblong, simple, very minute.*

On the interior of caves, rare. Miderlin! near Kylemore, co. Galway, Ireland, *Mr. Larbalestier* (1877).

Gelatina hymenea I very pale blue. Spores ·009 mm. long, ·0025 mm. broad. A very remarkable and apparently distinct species.

Calicium kylemoriense, Larbal. *Parasitical* on a whitish thallus, apparently that of *Lecanora cinerea*, L.; *apothecia excessively minute, shortly stipitate*; *capitulum crateriform, nigro-fuscous, somewhat shining*; *stipes very short, of a paler whitish colour*; paraphyses entangled, branched; *spores fuscous or fusco-nigrescent, sphærical*, with a distinct narrow epispore, variable in size.

On shady rocks, rare. Miderlin! near Kylemore, co. Galway, Ireland, *Mr. Larbalestier* (1877).

Spores ·006–·008 mm. diam. A very beautiful new species.

Verrucaria Larbalestierii, Leight. *Thallus albido-glaucescent*, thin, tartareous, effuse, *minutely rimuloso-diffract*; *areolæ plane, smooth, somewhat shining*, having 1 or 2 apothecia in the centre of each areola; (K yellow, C —;) *apothecia black, moderately large, semi-immersed, internally dark, nigro-fuscous*; ostiolum hemi-

D.Blair lith.

NEW IRISH LICHENS.

M&N.Hanhart imp.

sphærical, prominent, shining; epithecium a minute depressed pore; *perithecium black, entire*; *paraphyses none*; *spores* 8, *fusco-nigricant, oblong*, 1-*septate, minute.*

On granite rocks, rare. Near Kylemore! co. Galway, Ireland, *Mr. Larbalestier* (1877).

A delicately beautiful species, to which I give the name of its talented discoverer. Spores ·016 mm. long, ·008–·0085 mm. broad. Gelatina hymenea I —.

DESCRIPTION OF PLATE XXXIII.

Fig. 1. *Pertusaria incarnata.* Enlarged view of the thallus, to show the peculiar structure, the position, and the nature of the apothecia.
Fig. 2. Vertical section of apothecium of the same, enlarged.
Fig. 3. Spores of the same lichen, magnified 600 times.
Fig. 4. *Lecidea polospora.* Vertical section of apothecium, enlarged.
Fig. 5. Its paraphyses, also very considerably enlarged.
Fig. 6. Spores of the same lichen, magnified 1200 times.
Fig. 7. *Lecidea grumosa.* Vertical section of an apothecium, enlarged.
Fig. 8. Ascus of *L. grumosa,* enlarged.
Fig. 9. Spores of the same lichen, magnified 1200 times.
Fig. 10. *Lecidea antrophila.* Section of apothecium, enlarged.
Fig. 11. Spores of *L. antrophila,* magnified 1200 times.
Fig. 12. *Calicium kylemoriense.* Three of the apothecia, of natural size.
Fig. 13. An apothecium of the same, enlarged.
Fig. 14. Spores of this lichen, magnified 1200 times.
Fig. 15. *Verrucaria Larbalestierii.* Enlarged view of the thallus, to show its structure and the position of the apothecium.
Fig. 16. Vertical section of the apothecium, also enlarged.
Fig. 17. Spores of the same lichen, magnified 1200 times.

XVII. *Report on the Liliaceæ, Iridaceæ, Hypoxidaceæ, and Hæmodoraceæ of Welwitsch's Angolan Herbarium.* *By* J. G. Baker, Esq., *F.L.S.*

(Plates XXXIV.–XXXVI.)

Read March 1st, 1877.

THE present paper is devoted to a systematic account of the Liliaceæ, Iridaceæ, Hypoxidaceæ, and Hæmodoraceæ of the Angolan herbarium of the late Dr. Welwitsch. As will be seen, a very large proportion of the species are new to science. In the Liliaceæ there are two new genera, represented by five species; but the remaining novelties all belong to generic types already known either in Central Africa or at the Cape. The previously known flora of Central Africa in these orders is poor in numbers, and does not possess any strongly marked individuality of character. Its members, with few exceptions, belong either to the great cosmopolitan or great widely spread exclusively Old-World genera, like *Ornithogalum*, *Scilla*, *Urginea*, *Chlorophytum*, *Asparagus*, *Dracæna*, and *Gladiolus*, or are out-wandering representatives of the well-known characteristic Cape types, such as *Aloë*, *Kniphofia*, *Eriospermum*, *Albuca*, *Moræa*, *Anomatheca*, *Geissorhiza*, *Aristea*, and *Lapeyrousia*. Three well-known genera which attain their maximum in Central Africa are *Dracæna*, *Sanseviera*, and *Gloriosa*. *Walleria*, with two species, is the only previously known endemic Central-African genus. Dr. Welwitsch's collection, though it will more than double the number of species known in Central Africa, does not materially alter these general characters. In Liliaceæ it adds the two new endemic genera to which I have just referred; it carries within the tropic four Cape genera not previously known as intertropical—*Sandersonia*, *Tulbaghia*, *Schizobasis*, and *Haworthia*—and plants in more firmly *Aloë* and *Eriospermum* as intertropical genera. In the other orders all the genera represented are known in Central Africa already. I need scarcely add my tribute of appreciation of the excellence of Dr. Welwitsch's specimens, and of the pains which he must have taken in selecting them to show all the various stages and characters of the plants as fully and clearly as possible, or explain that in drawing up these descriptions I have been in many cases greatly indebted to the notes which he made upon the plants at the time when they were gathered. In my 'Systema' I have already indicated the position in the sequence of species of the Iridaceæ of this collection. In the present paper I have done this for the Liliaceæ by means of the numbers prefixed to the names, which refer to my monographs already published in the Journal of the Linnean Society. My best thanks are due to the executors of the late Dr. Welwitsch for the facilities they have given me in consulting the specimens and notes, which latter have been separated and copied for the British Museum, and upon both of which this paper is founded.

Order Liliaceæ.

Kniphofia, Mœnch. (Journ. Linn. Soc. xi. 360.)

K. benguellensis, Welw. Herb. Herba 3–5-pedalis, rhizomate verticali lignoso, fibris copiosis cylindricis. Folia 3–4-pedalia, linearia, basi 6–9 lin. lata, a basi ad apicem attenuata, acuminata. Scapus 2–3-pedalis. Racemus subspicatus densus semipedalis vel pedalis, expansus 8–9 lin. crassus. Pedicelli brevissimi vel subnulli. Bracteæ deltoideæ membranaceæ, perianthio triplo breviores. Perianthium luteum campanulatum $2\frac{1}{2}$ lin. longum, segmentis oblongis tubo æquilongis. Stamina demum exserta, antheris oblongis $\frac{1}{2}$ lin. longis. Capsula globosa brunnea rugosa $2\frac{1}{2}$ lin. longa, seminibus brunneis lucidis. *Huilla in palustribus juxta rivulos, socialis cum* Richardia angolensi *et* Epilobio æthiopico. Floret Dec.–Jan.

K. andongensis, Baker. Herba gigantea, rhizomate incrassato, fibris radicalibus carnosis pedalibus vel sesquipedalibus. Folia linearia 6–9-pedalia, basi 8–9 lin. lata, ad apicem sensim angustata. Scapus foliis æquilongus, basi 1 poll. crassus. Racemus densus, inexpansus semipedalis. Pedicelli brevissimi. Bracteæ lanceolatæ 2 lin. longæ. Perianthium rubellum oblongum 3 lin. longum, segmentis oblongis tubo turbinato æquilongis. Flores perfecte expansos non vidi. *Pungo Andongo in dumetis petrosis alte graminosis inter Luxillo et Cotete.* Floret Maio. "Pongo" incolarum. Species angolenses ab reliquis notis recedunt perianthio profunde lobato.

Tulbaghia, Linn. (Journ. Linn. Soc. xi. 369.)

1*. T. æquinoctialis, Welw. Herb. Bulbus ovoideus 6–9 lin. crassus, tunicis brunneis membranaceis. Folia 3–5 anguste linearia glabra subglaucescentia erecta 4–6 poll. longa, vix 1 lin. lata. Scapus gracilis folia superans. Umbella 3-flora, spathæ valvis 2 lanceolatis 3–4 lin. longis, pedicellis horizontalibus vel cernuis 3–4 lin. longis. Perianthium album 5 lin. longum, segmentis lanceolatis tubo æquilongis. Corona minutissima flava profunde lobata. *Pungo Andongo, in dumetis humidiusculis.* Floret Martio.

Dipcadi, Medic. (Journ. Linn. Soc. xi. 395.)

10*. D. oxylobum, Welw. Herb. Bulbus subglobosus 6–9 lin. crassus, tunicis membranaceis albidis. Folia 2 suberecta subulata glabra facie canaliculata 4–6 poll. longa $\frac{1}{2}$ lin. lata. Scapus gracilis flexuosus 6–9-pollicaris. Racemus laxus secundus 2–3-pollicaris 5–10-florus. Pedicelli 1–2 lin. longi. Bracteæ lanceolato-deltoideæ cuspidatæ viridulæ 2–3 lin. longæ. Perianthium viridulum cinnamomeo-rubens, segmentis interioribus 5 lin. longis, exterioribus 7–8 lin longis apice caudatis. *Pungo Andongo in declivis breviter herbidis rupium ipsius Præsidii, regio temp.* (2400–3800 pedes). Floret Nov.

14. D. Welwitschii, Baker in Journ. Linn. Soc. xi. 400. Racemus secundus laxe 6–15-

florus. Capsula globoso-quadrangulata 4 lin. longa. *Huilla, regio temperata, in dumetis herbidis prope Lopollo.* Floret Nov.–Dec.

17*. D. LATERITIUM, Welw. Herb. Bulbus globosus 9–12 lin. crassus, tunicis membranaceis albidis. Folia 2–4 linearia carnoso-herbacea erecta glabra ad apicem attenuata, pedalia vel sesquipedalia, 5–6 lin. lata. Scapus fragilis gracilis pedalis vel sesquipedalis. Racemus laxus secundus 2–6-pollicaris. Pedicelli ascendentes, inferiores demum 6–9 lin. longi. Bracteæ lineares acuminatæ 3–6 lin. longæ. Perianthium lateritium, segmentis interioribus 4–4½ lin. longis, exterioribus semipollicaribus apice distincte caudatis. Capsula sessilis 1½ lin. longa. *Huilla, regio temperata, in rupestribus editis Marro de Monimo ditionis Lopollo.* Floret Martio.

18*. DIPCADI COMOSUM, Welw. Herb. (Plate XXXIV. figs. 1–3.) Bulbus depresso-globosus, tunicis læte incarnatis, basi bulbillis stipatus. Folia linearia carnoso-herbacea glabra erecta bipedalia, basi 5–6 lin. lata, ad apicem attenuata, facie canaliculata. Scapus 3–4-pedalis, raro 5-pedalis. Racemus 1½–2-pedalis laxe 30–60-florus, pedicellis inferioribus 3–4 lin. longis, floribus viridibus, inferioribus perfectis 8–9 lin. longis, caudis brevibus, centralibus segmentis interioribus 3–4 lin. longis, exterioribus longe caudatis, floribus superioribus more *Muscari* parvis abortivis. Bracteæ superiores lineares acuminatæ 3–4 lin. longæ. *Huilla in arenosis dumetosis siccioribus inter Lopollo et Catumba.* Floret Aprili.

URGINEA, Steinh. (Journ. Linn. Soc. xiii. 215.)

14*. U. (SQUILLA) PSILOSTACHYA, Welw. Herb. Bulbus magnitudine pugni, apice hypogæo, tunicis multis albidis coriaceis. Folia post scapum perfecta 5–6 subcoriacea lorata glabra pedalia vel sesquipedalia 12–14 lin. lata. Scapus 2–3-pedalis. Racemus laxus sesquipedalis, expansus 1 poll. latus, pedicellis suberectis vel cernuis 3–4 lin. longis. Bracteæ minutæ lineares supra basin calcaratæ. Perianthium albidum 2½ lin. longum, segmentis late viridi vittatis. Stamina perianthio æquilonga, filamentis subulatis, antheris oblongis flavis ½ lin. longis. Stylus cylindricus exsertus. Capsula globoso-trigona 4 lin. longa. *Cazengo in dumetis siccis arenosis.* Floret Aug.

20*. U. (ALBUCOPSIS) COMOSA, Welw. Herb. Bulbus magnus globosus, tunicis membranaceis. Folia 6–8 carnoso-herbacea lineari-lorata erecta glauca 2–3-pedalia, basi 9–12 lin. lata, facie canaliculata, ad apicem attenuata. Scapus tripedalis et ultra. Racemus pedalis vel sesquipedalis, expansus 2–2½ poll. crassus, rachi stricta incrassata rugosa. Bracteæ subulatæ 6–9 lin. longæ ante anthesin comosæ. Pedicelli inferiores 6–9 lin. longi. Perianthium albidum 4–5 lin. longum, segmentis lanceolatis viridi-vittatis 5-nervatis. Filamenta perianthio paulo breviora, antheris flavis oblongis 1 lin. longis. Capsula 9 lin. longa profunde 3-lobata, seminibus multis discoideis nigris nitidis 4 lin. latis. *Mossamedes et Huilla, in pascuis sylvaticis humidiusculis inter Lopollo et Monino.* Floret Dec.–Jan.

30*. Urginea (Albucopsis) chlorantha, Welw. Herb. Bulbus globosus $1\frac{1}{2}$ poll. crassus tunicis membranaceis. Folia 6–8 carnoso-herbacea lorata glabra bipedalia basi 1 poll. lata ad apicem acutum attenuata. Scapus elongatus. Racemus florifer semipedalis, fructifer sesquipedalis $1\frac{1}{2}$ poll. latus. Bracteæ subulatæ 6–9 lin. longæ ante anthesin comosæ, haud calcaratæ. Pedicelli 4–6 lin. longi. Perianthium albidum $4\frac{1}{2}$ lin. longum, segmentis lanceolatis viridi vittatis dorso distincte 5-nervatis. Filamenta linearia perianthio paulo breviora, antheris oblongis 1 lin. longis. Stylus ovario æquilongus. Capsula depresso-globosa 9 lin. lata profunde lobata, seminibus in loculo multis discoideis nigris nitidis 4 lin. latis. *Loanda, Pungo Andongo et Golungo Alto, in declivis olim cultis.* Floret Jan.–April.

Ornithogalum, Linn. (Journ. Linn. Soc. xiii. 257.)

37*. O. (Beryllis) benguellense, Baker. Bulbus ovoideus 6–9 lin. crassus, tunicis membranaceis brunneis apice haud setiferis. Folia 2–3 subteretia carnoso-herbacea glabra erecta semipedalia 1 lin. crassa. Scapus gracilis 6–9-pollicaris. Racemus laxus lanceolatus subsecundus 3–4-pollicaris. Pedicelli ascendentes, inferiores 3–4 lin. longi. Bracteæ minutæ deltoideæ, inferiores calcaratæ. Perianthium 2 lin. longum, segmentis albis purpureo vittatis. Stamina perianthio paulo breviora, antheris conformibus linearibus. Capsula immatura oblonga. *Huilla, regio temperata, in dumetis arenosis ad Lopollo.* Floret Nov.

46*. O. (Beryllis) cepæfolium, Baker. Bulbus globosus tunicatus $1\frac{1}{2}$–2 poll. crassus. Folia 4–5 lanceolata glabra acuminata pedalia vel sesquipedalia, basi 1–$1\frac{1}{2}$ poll. lata, facie canaliculata. Scapus bipedalis. Racemus densus 2–3-pollicaris, bracteis inferioribus multis haud floriferis. Bracteæ lineares 5–6 lin. longæ haud calcaratæ, ante anthesin comosæ. Pedicelli 2–3 lin. longi. Perianthium campanulatum 3 lin. longum, segmentis albis dorso viridi vittatis multinervatis. Filamenta conformia lanceolata 2 lin. longa, antheris oblongis 1 lin. longis. Capsula globosa 4 lin. longa, seminibus in loculo 6–8 compressis dimidiato-oblongis nigris. *Pungo Andongo et Huilla, in apricis herbidis prope Lopollo.* Floret Dec.

Scilla, Linn. (Journ. Linn. Soc. xiii. 228.)

13*. S. (Euscilla) hispidula, Baker. Bulbus oblongus 2–3 poll. crassus basi durus, tunicis densis crassis coriaceis. Folia 5–6 lanceolata rigida dura coriacea glabra 4–6 poll. longa, basi 1 poll. lata, nervis crebris exsculptis. Scapus 4–6-pollicaris cylindricus sursum pilosus. Racemus densus, expansus 4–8 poll. longus, 1 poll. crassus, rachi incrassata rugosa dense pilosa. Pedicelli patentes 3–4 lin. longi. Bracteæ lineari-subulatæ, pedicellis æquilongæ. Perianthium campanulatum albidum $1\frac{1}{2}$ lin. longum. Stamina inclusa conformia. Stylus exsertus. Capsula sessilis, globosa, profunde lobata, 2 lin. longa, seminibus in loculo binis erectis.—*Huilla, in dumetis apricis arenoso-argillaceis prope Lopollo.* Floret Nov.

40*. SCILLA (LEDEBOURIA) BENGUELLENSIS, Baker. Bulbus globosus 1–2 poll. crassus, tunicis brunneis. Folia 2–6 sessilia synanthia linearia suberecta 4 lin. longa medio 3–4 lin. lata ad basin et apicem attenuata. Scapus flexuosus 2–3-pollicaris. Racemus densus oblongus 12–18 lin. longus, floribus inferioribus cernuis, pedicellis 2–3 lin. longis, bracteis minutis deltoideis. Perianthium campanulatum $1\frac{1}{2}$ lin. longum, segmentis rubro-purpureis late viridi vittatis. Capsula sessilis globosa. *Huilla in pascuis apricis subarenosis prope Lopollo.* Floret Nov.

40*. S. (LEDEBOURIA) POLYPHYLLA, Baker. Bulbus globosus, 1 poll. crassus, tunicis brunneis. Folia 10–12 synanthia erecta subteretia glabra 3 poll. longa vix 1 lin. crassa. Scapus foliis æquilongus. Racemus laxus pauciflorus 5–6 lin. longus. Pedicelli perianthio æquilongi. Bracteæ minutæ deltoideæ. Perianthium campanulatum intense rubro-purpureum $1\frac{1}{2}$ lin. longum, segmentis oblanceolatis infra medium reflexis. Stamina perianthio æquilonga. *Pungo Andongo et Golungo Alto in declivis rupestribus.* Floret Julio. Habitus *Scillæ autumnalis.*

40*. S. (LEDEBOURIA) ARENARIA, Baker. Bulbus ovoideus 6–9 lin. crassus, tunicis brunneis membranaceis. Folia 3–6 synanthia linearia erecta carnoso-herbacea glauco-viridia obscure petiolata 2 poll. longa $1\frac{1}{2}$ lin. lata ad apicem sensim angustata. Scapus tripollicaris erectus gracilis. Racemus laxus oblongus, expansus 9–12 lin. longus, 5–6 lin. latus, pedicellis $1\frac{1}{2}$–2 lin. longis, inferioribus cernuis, bracteis minutis deltoideis. Perianthium campanulatum purpureum 1 lin. longum, segmentis infra medium falcatis. Filamenta perianthio æquilonga saturate purpurea. Capsula globosa stipitata. *Pungo Andongo in pascuis arenosis sylvaticis.* Floret Martio.

47*. S. (LEDEBOURIA) SIMIARUM, Baker. Bulbus ovoideus 9–12 lin. crassus, tunicis brunneis membranaceis. Folia 3–4 synanthia carnoso-herbacea lanceolata glauco-viridia patula basi purpureo maculata 3–4 poll. longa, supra basin 5–6 lin. lata, acuta, haud petiolata. Scapus 2–3-pollicaris. Racemus oblongus sublaxus, florifer expansus 12–15 lin. longus, pedicellis $1\frac{1}{2}$–2 lin. longis plerisque cernuis, bracteis minutis deltoideis. Perianthium viridulum purpureo tinctum campanulatum 1 lin. longum. Filamenta cyanea perianthio demum æquilonga. Capsula sessilis globosa. *Pungo Andongo et Loanda in sabulosis æstate inundatis.* Floret Aprili. "Bulbi simiis gratissimum pabulum."

47*. S. (LEDEBOURIA) FLACCIDULA, Baker. Bulbus globosus 8–9 lin. crassus, tunicis brunneis membranaceis. Folia 2–4 synanthia flaccida lorata carnoso-herbacea glabra 6–12 poll. longa 4–8 lin. lata acuta sessilia. Scapus debilis foliis æquilongus. Racemus laxus oblongus, fructifer 3–4 poll. longus, 6–8 lin. latus, pedicellis centralibus 2–3 lin. longis, bracteis minutis deltoideis. Perianthium campanulatum viridulum $1\frac{1}{4}$–$1\frac{1}{2}$ lin. longum,—segmentis infra medium falcatis. Stamina perian-

thio æquilonga. Stylus exsertus. Capsula sessilis globosa. *Pungo Andongo in rupestribus ipsius Præsidii.* Floret Nov.

47*. Scilla (Ledebouria) laxiflora, Baker. Bulbus globosus 12–15 lin. crassus, tunicis brunneis membranaceis. Folia 3–4 synanthia carnoso-herbacea oblanceolata 4–5 poll. longa, supra medium 5–6 lin. lata, acuta, ad basin angustata. Scapus foliis æquilongus. Racemus cylindricus laxissimus 4–5-pollicaris, pedicellis centralibus patentibus 3–4 lin. longis, inferioribus cernuis, bracteis minutis deltoideis. Perithium viridulum campanulatum 1 lin. longum,—segmentis infra medium falcatis. Stamina perianthio æquilonga. Ovarium sessile, stylo exserto. *Loanda in collinis breviter graminosis.* Floret Maio.

48*. S. (Ledebouria) congesta, Baker. Bulbus globosus $1\frac{1}{2}$–2 poll. crassus, tunicis brunneis membranaceis. Folia 3 synanthia carnoso-herbacea lanceolata sessilia acuta 3–6 poll. longa, prope basin 12–15 lin. lata. Scapus 3–4-pollicaris. Racemus densus subspicatus, florifer 2 poll. longus, pedicellis infimis 1 lin. longis, bracteis minutis deltoideis. Perianthium campanulatum viridulum $2\frac{1}{2}$ lin. longum. Genitalia inclusa. Ovarium sessile. *Huilla in collinis dumetosis agri Lopollensis.* Floret Jan.

48*. S. (Ledebouria) platyphylla, Baker. Bulbus magnus ovoideo-globosus. Folia 4 synanthia carnoso-herbacea glabra oblonga acuta semipedalia, medio 15–18 lin., basi 1 poll. lata. Scapus semipedalis. Racemus densus $1\frac{1}{2}$–2 poll. longus, pedicellis omnibus ascendentibus $1\frac{1}{2}$–2 lin. longis, bracteis minutis deltoideis. Perianthium viridulum campanulatum 2 lin. longum. *Huilla, regio temperata, in dumetosis collinis parce graminosis inter Lopollo et Catumba.* Floret Dec.

57. S. (Ledebouria) lanceæfolia, Baker in Saund. Ref. Bot. t. 182. Species capensis late disseminata. *Lopollo in collinis et Huilla in pascuis arenosis sylvaticis prope Mompulla, regio temperata.* Floret Oct.

Albuca, Linn. (Journ. Linn. Soc. xiii. 285.)

7*. A. (Falconera) myogaloides, Welw. Herb. Bulbus ovoideus 1 poll. crassus, tunicis apice in setas dissolutis. Folia 3–4 synanthia glabra carnoso-herbacea erecta anguste linearia 1–2-pedalia, 3–4 lin. lata. Scapus pedalis, vel sequipedalis. Racemus laxus 6–12-florus semipedalis vel pedalis, pedicellis ascendentibus inferioribus 2–3 poll. longis, floribus erectis, bracteis lanceolatis inferioribus 6–9 lin. longis. Perianthium album 6–7 lin. longum, segmentis 2 lin. latis dorso viridi vittatis. Filamenta exteriora antheris parvis instructa. Stylus prismaticus ovario æquilongus. Capsula oblonga perianthio æquilonga. *Huilla in rupestribus editis Morro de Monino.* Floret Aprili. Ad *A. caudatam* capensem arcte accedit.

10*. ALBUCA (FALCONERA) MONOPHYLLA, Baker. *A. juncifolia*, Welw. Herb., non Baker in Gard. Chron. 1876, 534. Bulbus globosus 6–9 lin. crassus, tunicis teneris membranaceis apice haud setiferis. Folia solitaria raro bina teretia carnoso-herbacea glabra pedalia vix 1 lin. crassa glauco-viridia basi canaliculata. Scapus 4–8-pollicaris. Racemus laxe 2–6-florus, pedicellis erectis 3–4 lin. longis, floribus subnutantibus, bracteis lanceolatis cuspidatis 3–4 lin. longis. Perianthium $4\frac{1}{2}$–5 lin. longum luteum, segmentis late viridi vittatis, exterioribus $1\frac{1}{2}$ lin. latis. Filamenta omnia fertilia, antheris parvis oblongis luteis. Stylus prismaticus ovario æquilongus. *Pungo Andongo in rupestribus editis Præsidii Pedra de Cabonda.* Floret Aprili.

14*. A. (PALLASTEMA) SUBSPICATA, Baker. Bulbus globosus 6–9 lin. crassus, tunicis membranaceis apice haud setiferis. Folia 3–4 synanthia subulata carnoso-herbacea pedalia ad apicem attenuata. Scapus flexuosus 4–6-pollicaris. Racemus angustus 2–4-pollicaris, 4–12-florus, pedicellis adscendentibus $1\frac{1}{2}$–3 lin. longis, floribus erectis vel patulis, bracteis lanceolatis longe cuspidatis inferioribus 6–9 lin. longis. Perianthium album 6 lin. longum, segmentis viridi vittatis 2 lin. latis. Filamenta omnia fertilia perianthio paulo breviora. Stylus gracilis ovario æquilongus. *Huilla ad rupes editas de Morro de Mino.*

14* A. (PALLASTEMA) GALEATA, Welw. Herb. Bulbus ovoideus, tunicis brunneis membranaceis. Folia synanthia glabra carnoso-herbacea flaccida viridia bipedalia 3–4 lin. lata, facie canaliculata. Scapus 1–2-pedalis. Racemus laxus 3–5-pollicaris, expansus $1\frac{1}{2}$–2 poll. latus, pedicellis erecto-patentibus, infimis 5–6 lin. longis, floribus superioribus patulis, inferioribus cernuis, bracteis lanceolatis cuspidatis 3–6 lin. longis. Perianthium albidum subbilabiatum 7–$7\frac{1}{2}$ lin. longum, segmentis late viridi vittatis, tribus inferioribus declinatis, suprema galeata. Stamina omnia fertilia, antheris oblongis $1\frac{1}{2}$ lin. longis. Stylus filiformis ovarium superans. *In dumetis petrosis prope Giucanda.* Floret Sept. "Dispositio laciniarum perigonii singularis quasi corollam bilabiatam fingens. Lacinia interna suprema galeam mentiens, in concavitate stamina 3 lacinia arcte adpressa gerentem." Welw. Herb.

15. A. ANGOLENSIS, Welw.; Baker in Saund. Ref. Bot. t. 336. *Huilla in pratis altis herbidis inter Lopollo et rivulo ejusdem nominis sporadica.* Floret Dec.–Feb.

15*. A. (PALLASTEMA) CHLORANTHA, Welw. Herb. Bulbus globosus $1\frac{1}{2}$ poll. crassus, tunicis membranaceis apice haud setiferis. Flora plura synanthia lorata carnoso-herbacea glabra acuminata $1\frac{1}{2}$–2-pedalia, basi $1\frac{1}{2}$ poll. lata. Scapus elongatus. Racemus subdensus pedalis, expansus 2 poll. latus, pedicellis $1\frac{1}{2}$–2 lin. longis, bracteis lanceolatis acuminatis $1\frac{1}{2}$–2 poll. longis, floribus inferioribus horizontalibus, supremis ascendentibus subsessilibus. Perianthium flavum 9–12 lin. longum, segmentis dorso late viridibus 2–3 lin. latis. Filamenta omnia fertilia, antheris oblongis 2 lin.

longis. Stylus filiformis 5–6 lin. longus, ovario æquilongus. *Pungo Andongo in dumetis ad ripas fluminis Juanza.* Floret Martio.

DRACÆNA, Vand. (Journ. Linn. Soc. xiv. 523.)

11*. D. PARVIFLORA, Baker. Arbor 20–35-pedalis dichotome ramosa, ramis erecto-patulis. Folia dense rosulata sessilia lanceolata subcoriacea 3–4-pedalia, medio 3 poll., supra basin 1 poll. lata, costa præter apicem perspicua, marginibus concoloribus. Panicula pedalis et ultra, floribus densis, ad apices ramorum 20–30 congestis, bracteis perminutis deltoideis, pedicellis 2 lin. longis. Perianthium albidum 4–4½ lin. longum, segmentis tubo æquilongis. Stylus exsertus. *Golungo Alto ad rivulos in editioribus sylvaticis.* Floret Feb. "*Die calunga*" incolarum.

15. D. FRAGRANS, Gawl. in Bot. Mag. t. 1081. *Pungo Andongo.*

19*. D. NITENS, Welw. Herb. Arbuscula 7–10-pedalis. Folia linearia laxe disposita subpatula subcoriacea viridia lucida 6–10 poll. longa, 4½–6 lin. lata, sessilia acuta, costa præter apicem perspicua, marginibus concoloribus. Pedunculus brevissimus. Panicula semipedalis vel pedalis, ramis pluribus brevibus patulis, pedicellis brevissimis, bracteis minutis deltoideis. Perianthium cylindricum albidum rubro tinctum, segmentis ligulatis tubo brevioribus. Stylus exsertus. *Golungo Alto et Pungo Andongo in montosis rupestribus.* Floret Sept.

25*. D. ACAULIS, Baker. Acaulis, rhizomate lignoso ½–1 poll. crasso. Folia omnia in rosulam basalem congesta lanceolata acuta firma 3–6-pedalia medio 2 poll. lata, in petiolum pedalem alatum sensim angustata. Panicula pedunculata 4–5-pedalis, ramis multis flexuosis ascendentibus racemosis, bracteis inferioribus semipedalibus. Pedicelli brevissimi aggregati. Perianthium albidum 14–15 lin. longum, segmentis tubo paullo longioribus. Stamina segmentis æquilonga, antheris oblongis 1½ lin. longis. Stylus demum exsertus. *Golungo Alto, regio* 2 (1000–2400 *pedes*) *in sylvaticis editioribus et ad rivulorum latera montium de Alta Queta.* Floret Julio.

33*. D. MONOSTACHYA, Baker. Acaulis. Folia omnia in rosulam basalem congesta oblongo-lanceolata acuta semipedalia vel pedalia, infra medium 1½–2 poll. lata, ad basin cuneatam rotundata, petiolo pedali instructa. Pedunculus pedalis, bracteis multis parvis lanceolatis præditus. Racemus simplex densus erectus 2–3-pollicaris, pedicellis brevissimis fasciculatis, bracteis minutis deltoideis. Perianthium non vidi. Bacca profunde lobata. *Insula Principis in herbidis subhumidis sylvarum non procul oceano.* Sept. (in fructu); et planta affinis Angolensis in ditione *Golungo Alto* adest foliis magis oblongis 6–8 poll. longis, 2–2½ poll. latis basi magis rotundatis, pedunculo breviore et racemo laxiore.

38*. D. INTERRUPTA, Baker. Arbuscula subscandens 3–4-pedalis, ramis virgatis cylindricis gracilibus. Folia in rosulas segregatas disposita oblongo-oblanceolata cuspi-

data 4–5 poll. longa, medio 2–2½ poll. lata, basi cuneata in petiolum brevem 1½ lin. latum angustata, costa præter apicem perspicua. Racemus simplex breviter pedunculatus 4–5-pollicaris, floribus dense fasciculatis, pedicellis 1½ lin. longis supra medium articulatis, bracteis membranaceis deltoideis vel lanceolatis 2–3 lin. longis. Flores odorati albi. Perianthium cylindricum 9–11 lin. longum, segmentis tubo subduplo brevioribus. Filamenta segmentis paullo breviora, antheris 1 lin. longis. Stylus demum exsertus. *Pungo Andongo, in sylvis ad marginem fluminis Tombe.* Floret Martio.

SANSEVIERA, Thunb. (Journ. Linn. Soc. xiv. 546.)

3*. S. BRACTEATA, Baker. Folia rigidissima coriacea lanceolata albo maculata rubro marginata 1–2-pedalia, medio 2–2½ poll. lata, basi in petiolum latum elongatum angustata. Pedunculus crassus strictus sesquipedalis vel pedalis, foliis multis reductis lanceolatis, inferioribus 3–4 poll. longis, præditus. Racemus simplex densus semipedalis, bracteis lanceolatis membranaceis 9–12 lin. longis, pedicellis brevissimis fasciculatis. Perianthium album 2½–3 poll. longum, segmentis ligulatis 8–9 lin. longis. Stamina inclusa, antheris oblongis 1½ lin. longis. *Pungo Andongo, in rupestribus subsiccis editioribus.* Floret Jan. Ad *S. longifloram* arcte accedens.

ASPARAGUS, Linn. (Journ. Linn. Soc. xiv. 594.)

28*. A. EQUISETOIDES, Welw. Herb. Frutex ramosissimus, ramis erecto-patentibus pinnatis, ramulis gracilibus erecto-patentibus pedalibus vel semipedalibus, internodiis ultimis 2–3 lin. longis. Folia ramorum basi calcari parvo deltoideo instructa. Cladodia ad nodos sæpissime nulla, raro producta solitaria subulata 2–3 lin. longa ad ramos adpressa. Flores non vidi. *Pungo Andongo, in arenosis ad ripas fluminis Cuenza.*

38*. A. BENGUELLENSIS, Baker. Arbuscula decumbens glabra subscandens, ramis gracilibus copiose pinnatis, ramulis adscendentibus vel patulis 4–6 poll. longis, internodiis ultimis 2–3 lin. longis. Folia inferiora lanceolata, obscure calcarata. Cladodia 3–6na subulata ascendentia 6–9 lin. longa. Pedicelli 1–2ni, raro 3–4ni, 4–5 lin. longi, medio articulati. Perianthium infundibulare 3 lin. longum, segmentis oblongo-spathulatis diu ascendentibus brunneo vittatis. Antheræ minutæ oblongæ, filamento triplo breviores. *Mossamedes et Huilla, in dumetis sylvestribus ad Mumpullo.* Floret Julio.

38*. A. PSILURUS, Welw. Herb. Herba erecta, 2–3-pedalis, habitu *A. officinalis,* ramis et ramulis copiosis gracillimis erecto-patentibus, ultimis pedalibus vel semipedalibus. Folia ramorum calcari obscuro deltoideo deflexo instructa. Cladodia 6–8na, subulata erecto-patenta 4–9 lin. longa. Pedicelli cernui solitarii 2–3 lin. longi medio

articulati ad nodos efoliatos sæpe producti. Perianthium infundibulare $1\frac{1}{2}$–2 lin. longum, segmentis albis brunneo vittatis diu ascendentibus. Antheræ minutæ oblongæ, filamento triplo breviores. *Pungo Andongo, in dumetis Cuazensibus, frequens.* Floret Maio.

53*. Asparagus deflexus, Baker. Frutex ramosissimus, glaber, ramis gracilibus, inferioribus deflexis, ramulis multis brevibus sæpe internodio unico solum præditis, internodiis ultimis 1–$1\frac{1}{2}$ lin. longis. Folia ramorum calcari parvo deflexo pungente instructa. Cladodia subulata 6–10na 3–4 lin. longa. Pedicelli $1\frac{1}{2}$–2 lin. longi, medio articulati, ad nodos laterales 1–2ni, ad nodos terminales sæpe 4–6ni. Perianthium $1\frac{1}{2}$ lin. longum, segmentis oblongo-spathulatis brunneo vittatis. Stamina perianthio distincte breviora, antheris minutis oblongis. *Pungo Andongo.* Floret Oct.

53*. A. pubescens, Baker. Frutex ramosissimus pubescens, ramulis arcuato-ascendentibus semipedalibus vel pedalibus, internodiis ultimis $1\frac{1}{2}$–2 lin. longis. Folia ramorum basi calcari deltoideo parvo pungente instructa. Cladodia 4–8na, subulata, erecto-patentia glabra 2–3 lin. longa. Pedicelli 1–2ni erecto-patentes $1\frac{1}{2}$–2 lin. longi, infra medium articulati, ad ramos vel nodos cladodiis nullis præditos sæpissime producti. Perianthium $1\frac{1}{2}$ lin. longum. Antheræ minutæ oblongæ luteæ. Bacca magnitudine pisi parvi. *Huilla, regio temperata, in pascuis siccis ad Catumba.* Floret Dec.

72*. A. angolensis, Baker. Frutex ramosissimus subscandens, habitu *A. africani*, ramis lignosis flexuosis puberulis, ramulis copiosis erecto-patentibus. Folia ramorum calcari subulato pungente deflexo 3–4 lin. longo instructa. Cladodia densissime fasciculata (20–50na) gracillima rigida subulata 6–9 lin. longa. Pedicelli patuli fasciculati 2 lin. longi prope basin articulati. Perianthium infundibulare $1\frac{1}{2}$ lin. longum. Stamina perianthio æquilonga, antheris minutis globosis. Bacca magnitudine pisi parvi. *Huilla, regio temperata.*

73. A. africanus, Lam. *Pungo Andongo, in sylvaticis.*

85. A. racemosus, Willd. *Loanda et Huilla, in dumetis.*

90*. A. drepanophyllus, Welw. Herb. Frutex glaber, latissime volubilis, ramis gracilibus lignosis, internodiis ultimis $1\frac{1}{2}$–2 lin. longis. Folia ramorum basi calcari pungente subulato 2 lin. longo prædita. Cladodia 3, inæqualia, linearia, falcata, rigidula acuta distincte costata, majora 9–12 lin., minora 2–3 lin. longa. Racemi sessiles, 3–6 poll. longi, $4\frac{1}{2}$–5 lin. lati, pedicellis 3–6nis 1–$1\frac{1}{2}$ lin. longis, medio articulatis. Perianthium campanulatum 1 lin. longum, segmentis late viridi vittatis. Antheræ minutæ oblongæ inclusæ. *Golungo Alto, in sylvis densis sporadicus.* Floret Maio.

SCHIZOBASIS, Baker. (Journ. Linn. Soc. xvi. 260.)

S. ANGOLENSIS, Baker. *Adenotheca aphylla*, Welw. Herb. Bulbus globosus 1–1½ poll. crassus intus albidus viscosus, tunicis brunneis membranaceis. Folia hysteranthia non vidi. Scapus gracilis semipedalis. Panicula deltoidea pedalis, ramis gracilibus erecto-patentibus, inferioribus compositis, ramulis ultimis 4–5 poll. longis. Pedicelli remoti solitarii ascendentes 3–4 lin. longi prope apicem articulati. Bracteæ minutæ deltoideæ. Perianthium 2 lin. longum, segmentis oblongis brunneo vittatis. Stamina inclusa, filamentis leviter applanatis, antheris oblongis filamento brevioribus. *Pungo Andongo, ad rupes ipsius Præsidii, alt.* 2400–3800 *pedum.* Floret Aug.

ACROSPIRA, Welw. Herb. (Genus novum Asphodelearum.)

Perianthium album, diu infundibulare, basi brevissime urceolatum, segmentis æqualibus oblanceolatis, nervis 3–5 in carinam centralem concretis. *Stamina* 6 inclusa profunde perigyna, *filamentis* brevibus æqualibus lanceolatis, *antheris* magnis linearibus basifixis apice spiraliter revolutis. *Ovarium* parvum sessile ovoideum 3-loculare, ovulis in loculo circiter 20 horizontalibus biseriatis; *stylus* leviter exsertus filiformis leviter declinatus superne sensim robustior, *stigmate* parvo capitato penicillato. *Fructum* non vidi.

A. ASPHODELOIDES, Welw. Herb. (Plate XXXIV. figs. 4–7.) Rhizoma obliquum, crassum, fibris multis gracilibus præditum. Folia 5–6 sessilia subcoriacea lorata 2–3-pedalia deorsum 12–15 lin. lata ad apicem angustata glabra crebre distincte nervata. Pedunculus 4–6-pedalis, foliis pluribus reductis præditus. Racemus pedalis vel sesquipedalis simplex vel basi ramis 1–2 parvis instructus, pedicellis ascendentibus 3–4nis inæqualibus 1–3 lin. longis, bracteis deltoideis. Perianthium 9–10 lin. longum, segmentis 1 lin. latis. Antheræ luteæ 5–6 lin. longæ. Stylus 8–9 lin. longus. *Pungo Andongo, in rupestribus editioribus, frequens.* Floret Mart.–April.

DASYSTACHYS, Baker. (Genus novum Asphodelearum.)

Perianthium album diu campanulatum, segmentis æqualibus lanceolatis dorso 1-nervatis. *Stamina* inclusa æqualia, *filamentis* profunde perigynis elongatis leviter applanatis, *antheris* parvis oblongis versatilibus. *Ovarium* sessile globosum apice et lateribus profunde lobatis triloculare, *ovulis* in loculo paucis superpositis; *stylus* filiformis declinatus exsertus, stigmate capitato. *Capsula* globosa profunde lobata loculicide trivalvis, *seminibus* in loculo paucis discoideis. *Herbæ africanæ tropicales, habitu* Antherici, *rhizomate obliquo tuberoso, fibris multis gracilibus prædito, foliis basalibus rosulatis linearibus vel lanceolatis arundinaceis crebre nervatis, pedunculo foliis reductis vaginato, floribus parvis in racemos subspicatos sæpissime simplices dispositis.*

1. D. PLEIOSTACHYA, Baker. *Anthericum? pleiostachyum*, Welw. Herb. Rhizoma tuberosum 6–9 lin. crassum, fibris pluribus radicalibus præditum. Folia basalia 3–4 lanceolata subcoriacea glabra crebre nervata subpedalia 6–9 lin. lata. Scapus 2–3-pedalis, foliis multis reductis linearibus adpressis præditus. Racemi 1–3 densi

subspicati 6–9 poll. longi 5–6 lin. lati, pedicellis brevissimis vel subnullis, bracteis setaceis 5–6 lin. longis basi dilatatis. Perianthium album 3 lin. longum. Stamina perianthio æquilonga, antheris minutis oblongis. Capsula globosa $2\frac{1}{2}$–3 lin. longa, lateribus profunde lobatis. *Pungo Andongo, in pratis graminosis ad ripas fluminis Cuenza.* Floret Aprili.

2. Dasystachys falcata, Baker. *Anthericum? falcatum*, Welw. Herb. Rhizoma oblongum tuberosum horizontale, fibris gracilibus multis præditum. Folia basalia rosulata 6–8 lorata facie canaliculata basin caulis longe vaginantia superne falcata 6–9 poll. longa 10–12 lin. lata crebre distincte nervata margine crispata. Pedunculus rubellus sesquipedalis vel bipedalis, foliis multis reductis præditus. Racemus simplex subspicatus, floriferus 3–4 poll., fructiferus 6–8 poll. longus, 8–9 lin. latus, pedicellis brevissimis. Perianthium album 3 lin. longum. Stamina perianthio æquilonga. Capsula 4 lin. longa, seminibus in loculo 3–4 discoideis. *Huilla, regio temperata, in rupestribus Morro de Lopollo et Mossamedes, in sylvis inter Bumbo et Bruco.* Floret Oct.–Jan.

3. D. colubrina, Baker. (Plate XXXV. figs. 1–6.) *Anthericum? colubrinum*, Welw. Herb. Rhizoma obliquum tuberosum, fibris radicalibus multis gracilibus præditum. Folia basalia exteriora rudimentaria rubro-purpureo maculata, interiora producta 5–6 linearia glabra subcoriacea pedalia, medio 3 lin. lata, ad apicem et basin angustata. Scapus simplex pedalis, foliis 2–3 reductis præditus. Recemus subspicatus simplex oblongus $1\frac{1}{2}$–2 poll. longus, 8–9 lin. latus, pedicellis subnullis, bracteis purpureis deltoideis longe cuspidatis, infimis 3–4 lin. longis. Perianthium 3 lin. longum, segmentis rubro-purpureo vittatis. Stamina perianthio æquilonga. Stylus declinatus longe exsertus. Capsula globosa 3 lin. longa, lateribus profunde lobatis. *Huilla, in pascuis rupestribus herbidis de Empalanca, alt.* 5500 *pedum.* Floret Jan.

4. D. campanulata, Baker. (Plate XXXV. figs. 7–10.) *Campylandra dasystachys*, Welw. Herb. Rhizoma obliquum tuberosum, fibris multis radicalibus gracilibus præditum. Folia rosulata basalia producta 5–6 lanceolata basin caulis longe vaginantia pedalia vel sesquipedalia basi 1 poll. lata crebre distincte nervata ad apicem sensim angustata, marginibus minute ciliatis et crispatis. Pedunculus 3–4-pedalis, foliis multis reductis vaginatus. Racemus simplex densus subspicatus 3–6-pollicaris 8–9 lin. crassus, bracteis lanceolatis longe acuminatis, inferioribus 5–6 lin. longis. Perianthium 4 lin. longum. Stamina perianthio æquilonga. Stylus 4–$4\frac{1}{2}$ lin. longus longe exsertus. Capsula 4 lin. longa, lateribus acute angulatis. *Huilla, regio temperata, in pratis herbidis inter Lopollo et lacum Mantalla.* Floret Martio.

Anthericum, Linn. (Journ. Linn. Soc. xv. 290.)

27*. A. (Phalangium) tenellum, Welw. Herb. Dense cæspitosum, rhizomate apice dense setifero, fibris radicalibus cylindricis 1–2 poll. longis. Folia dense rosulata

anguste linearia erecta glabra 2–3 poll. longa, 1 lin. lata ad apicem angustata. Scapi multi gracillimi folia sæpe superantes. Racemi laxissimi 2–3 poll. longi simplices vel paniculati, bracteis minutis deltoideis, pedicellis $1\frac{1}{2}$–3 lin. longis, inferioribus 2–3nis. Perianthium 3 lin. longum album membranaceum, segmentis anguste oblanceolatis, dorso laxe 3–4-nervatis. Stamina perianthio distincte breviora, antheris minutis oblongis, filamentis glabris. Stylus $1\frac{1}{2}$ lin. longus inclusus ovario æquilongus. *Huilla, regio temperata, in pascuis humidiusculis subarenosis de Morro Monino.* Floret Dec.

27*. Anthericum (Phalangium) dissitiflorum, Baker. Rhizoma parvum tuberosum, fibris radicalibus multis gracilibus præditum. Folia linearia glabra modice firma 3–5 poll. longa, $1\frac{1}{2}$ lin. lata, facie canaliculata, nervis crebris distinctis 12–15. Scapus supra folia eminens acute anceps. Racemus simplex laxus 1–$1\frac{1}{2}$-pollicaris 3–6-florus, pedicellis solitariis $1\frac{1}{2}$–3 lin. longis, medio articulatis, bracteis lanceolatis acuminatis 2–3 lin. longis. Perianthium 3–4 lin. longum, segmentis oblanceolatis dorso purpureo vittatis 5-nervatis. Stamina perianthio distincte breviora, antheris oblongis 1 lin. longis, filamentis linearibus glabris. Stylus 2 lin. longus. Capsula depresso-globosa 2 lin. longa. *Pungo Andongo, in pascuis humidis prope Condo.* Floret Martio.

27*. A. (Phalangium) benguellense, Baker. Cæspitosum, rhizomate setis densis coronato, fibris radicalibus gracilibus. Folia plura linearia glabra canaliculata 3–6 poll. longa 3–4 lin. lata 12–15-nervata minute ciliata. Scapus anceps nudus 3–9-pollicaris, erectus vel curvatus. Panicula deltoidea 3–4-pollicaris, floribus inferioribus 2–3nis, pedicellis 1–$1\frac{1}{2}$ lin. longis, bracteis deltoideis. Perianthium 4–$4\frac{1}{2}$ lin. longum, segmentis oblanceolatis dorso purpureo vittatis 3–5-nervatis. Stamina perianthio triente breviora, filamentis glabris, antheris parvis oblongis. *Huilla, regio temperata, in sylvis claris et pascuis dumosis circa Lopollo et Humpata.* Floret Jan.

27*. A. (Phalangium) limosum, Baker. Rhizoma tuberosum, fibris radicalibus gracilibus, brevibus. Folia radicalia 5–6 linearia subfirma pedalia 5–6 lin. lata crebre nervata. Scapus 3–6-pollicaris. Panicula 3–4-pollicaris, ramis pluribus erecto-patentibus, pedicellis $1\frac{1}{2}$–2 lin. longis medio articulatis, inferioribus fasciculatis. Perianthium 4–$4\frac{1}{2}$ lin. longum, segmentis lanceolatis purpureo vittatis dorso distincte 3–5-nervatis. Antheræ 2 lin. longæ, filamentis glabris. Stylus declinatus 2–$2\frac{1}{2}$ lin. longus. *Barra do Bengo, in inundatis limosis exsiccatis.*

27*. A. (Phalangium) andongense, Baker. Rhizoma obliquum tuberosum, fibris radicalibus filipendulis 2–3 poll. longis. Folia radicalia 4–6 anguste linearia glabra subcoriacea rigidula semipedalia 1–$1\frac{1}{2}$ lin. lata crebre nervata, marginibus minute ciliatis. Scapus simplex pedalis complanatus nudus. Racemus simplex laxus bipollicaris, pedicellis 3–4 lin. longis infra medium articulatis, inferioribus 2–3nis. Perianthium 4 lin. longum, segmentis purpureo vittatis dorso 3–4-nervatis. Stamina

perianthio subduplo breviora, antheris $1\frac{1}{2}$ lin. longis, filamento glabro duplo longioribus. Capsula globosa 3 lin. longa, valvis profunde horizontaliter plicatis. *Pungo Andongo, in arenosis humidis sylvaticis inter Luxillo et Cazella.* Floret Jan.

27*. Anthericum (Phalangium) orchideum, Welw. Herb. Rhizoma obliquum tuberosum, setis multis coronatum, fibris carnosis filipendulis. Folia radicalia 6–8 oblongo-lanceolata subcoriacea glabra crebre nervata 6–9 poll. longa, 12–15 lin. lata. Scapus 3–8-pollicaris. Racemus sæpissime simplex densus 3–4-pollicaris, pedicellis 3–6 lin. longis 3–6nis medio articulatis. Perianthium 4–$4\frac{1}{2}$ lin. longum, segmentis oblanceolatis dorso purpureo brunneo vittatis 7–9-nervatis. Stamina perianthio subduplo breviora, antheris oblongis filamento glabro æquilongis. Stylus declinatus 3 lin. longus. Capsula globosa 3 lin. longa, valvis horizontaliter plicatis. *Huilla, regio temperata, in graminosis humidiusculis ad basin Serra de Monino.* Floret Jan.

27*. A. (Phalangium) ustulatum, Welw. Herb. Rhizoma gracile late reptans. Folia 3 exteriora rudimentaria lanceolata firma nigro fasciata, 3 interiora producta stricta erecta teretia glabra 6–8 poll. longa, $\frac{1}{3}$ lin. crassa. Scapus simplex semipedalis. Racemus laxus simplex 1–$1\frac{1}{2}$-pollicaris, pedicellis 2–3nis $1\frac{1}{2}$–3 lin. longis, bracteis purpureis lanceolatis cuspidatis, infimis 3–4 lin. longis. Perianthium 4 lin. longum, segmentis purpureo-brunneo vittatis 4–5-nervatis. Stamina perianthio subduplo breviora, antheris oblongis filamento glabro æquilongis. *Huilla et Pungo Andongo, in spongiosis sylvaticis.* Floret Martio–Aprilem.

27*. A. (Phalangium) calyptrocarpum, Baker. Fibræ radicales cylindricæ flexuosæ, collo radicis dense setoso. Folia producta 1–2 teretia glabra pedalia et ultra vix 1 lin. crassa. Scapus semipedalis glaber gracilis. Panicula deltoidea 6–9-pollicaris, ramis pluribus ascendentibus, racemis laxissimis, internodiis infimis 12–18 lin. longis, pedicellis 2–3 lin. longis, inferioribus geminis, bracteis minutis deltoideis cuspidatis. Perianthium 3 lin. longum tenerum, basi circumscissum, segmentis dorso fusco vittatis. Stamina perianthio triente breviora, antheris oblongis filamento glabro æquilongis. Capsula turbinata, seminibus in loculo pluribus atris minutis triquetris. *Huilla, regio temperata, in pascuis petrosis tempore pluvii inundatis, inter Mumpulla et Lopollo.* Floret Dec.

33*. A. (Phalangium) pterocaulon, Welw. Herb. Rhizoma tuberosum, fibris radicalibus gracilibus, apice setis paucis præditum. Folia 3–4 linearia subcoriacea basin caulis longe amplectentia 2–3-pedalia, 5–6 lin. lata, nervis crebris pilosis. Scapus anceps compressus 3–5-pedalis. Racemus simplex strictus 3–6-pollicaris, nodis inferioribus distantibus, pedicellis 3–4 lin. longis medio articulatis, inferioribus 2–3nis. Perianthium album 5–6 lin. longum, segmentis dorso anguste vittatis. Stamina perianthio subduplo breviora, antheris oblongis filamentis linearibus glabris æquilongis. Capsula subglobosa 3–4 lin. longa. *Pungo Andongo, in dumetis inter Calundo et Pedras de Guinza.* Floret Martio.

33*. ANTHERICUM (PHALANGIUM) ARENARIUM, Baker. Fibræ radicales cæspitosæ graciles semipedales filipendulæ, collo radicis dense setoso. Folia producta 3–4 lanceolata falcata rigida coriacea 5–6 poll. longa, e medio 3–9 lin. lato ad apicem et basin angustata, nervis 30–40 crebris dense pilosis. Scapus pedalis vel semipedalis subcompressus superne pilosus. Racemus densus simplex 1–2-pollicaris, bracteis pilosis lanceolatis 6–9 lin. longis, pedicellis 2–3nis medio articulatis, inferioribus 3–4 lin. longis. Perianthium album 4–4½ lin. longum, segmentis dorso multinervatis. Stamina perianthio subduplo breviora, antheris linearibus filamento glabro æquilongis. Capsula globosa 3 lin. longa. *Pungo Andongo, in dumetis arenosis inter Candumbe et Lombe.* Floret Martio.

A. DRIMIOPSIS, Baker (J. L. S. xv. 301). Planta zambesiaca a Kirkio lecta etiam ad genus pertinet.

50. A. (TRACHYANDRA) JACQUINIANUM, Schult. *Huilla, regio temperata, in pascuis et arenosis humidiusculis.* Floret Jan.–Feb.

Var. AFFINIS, Baker. *Pungo Andongo.*

54*. A. (TRACHYANDRA) PYRENICARPUM, Welw. Herb. Fibræ radicales graciles, collo radicis squamis parvis membranaceis cincto. Folia 6–8 anguste linearia parce pilosa linearia facie canaliculata 6–8 poll. longa 1 lin. lata. Scapi 2–4ni 2–3-pollicares subtiliter pilosi. Racemus laxus simplex 2–3-pollicaris, pedicellis 3–4 lin. longis, inferioribus cernuis, bracteis lineari-subulatis 3–4 lin. longis. Perianthium album 4 lin. longum, segmentis oblanceolatis. Stamina perianthio triente breviora, antheris minutis. Capsula glabra turbinata 3 lin. longa, seminibus in loculo solitariis. *Huilla, regio temperata, in pascuis humidis inter Humpata et Gambas.* Floret Jan.

69*. A. (DILANTHES) MOLLE, Baker. Fibræ radicales densæ, interdum apice filipendulæ oblongæ. Folia rosulata 20–30 petiolata; petiolus 1–3-pollicaris pilis lanosis patulis densis præditus; lamina lanceolata 2–3-pollicaris dense pilosa crebre nervata. Scapus semipedalis gracilis erectus. Racemus simplex vel furcatus densus 1–1½-pollicaris, bracteis pilosis lanceolatis acuminatis 3–6 lin. longis, pedicellis 2–3 lin. longis medio articulatis, inferioribus 2–3nis. Perianthium 3 lin. longum, segmentis albis lanceolatis dorso purpureo vittatis 5-nervatis. Antheræ 1½ lin. longæ, filamenta subulata muricata superantes. Stylus declinatus 2 lin. longus. Capsula globosa 2 lin. longa, valvis horizontaliter plicatis. *Pungo Andongo, in apricis petrosis totius Præsidii.* Floret Nov.–Dec.

CHLOROPHYTUM, Ker. (Journ. Linn. Soc. xv. 321.)

5. C. MACROPHYLLUM, Aschers. *C. leucolepis*, Welw. Herb. *Pungo Andongo, in rupium fissuris ad scaturigines et juxta rivulos Præsidii.* Floret Dec.

7*. Chlorophytum filipendulum, Baker. Rhizoma obliquum, fibris radicalibus filipendulis 2–4 poll. longis. Folia pauca petiolata; petiolus canaliculatus 1–4-pollicaris; lamina oblongo-lanceolata membranacea glabra 6–9 poll. longa, $1\frac{1}{2}$–2 poll. lata, supra viridis, infra pallida, acuta, basi cuneata, nervis perspicuis 20–25 prædita. Scapus semipedalis vel pedalis, nudus vel folio unico instructus. Racemus laxus semipedalis simplex vel raro furcatus, bracteis viridibus lanceolatis 4–6 lin. longis, pedicellis 2–3nis, inferioribus 3–4 lin. longis. Perianthium albo-viridulum 3–4 lin. longum, segmentis dorso distincte trinervatis. Stamina perianthio triente breviora, antheris 1 lin. longis, filamento subulato. Capsula oblonga 4 lin. longa, seminibus in loculo 6–8. *Golungo alto in umbrosis ad rivulos in montes de Queta.* Floret Dec.

8*. C. lancifolium, Welw. Herb. Fibræ radicales graciles 3–4 poll. longæ. Folia rosulata 5–6; petiolus 5–6-pollicaris; lamina lanceolata vel oblongo-lanceolata glabra membranacea 3–4 poll. longa acuta, basi cuneata vel rotundata, venis perspicuis 12–15. Scapus 3–4-pollicaris. Racemus simplex laxissimus, floriferus expansus semipedalis, fructiferus pedalis, bracteis lanceolatis 3–4 lin. longis, pedicellis 3–4nis 1–$1\frac{1}{2}$ lin. longis supra medium articulatis. Perianthium albo-viridulum 2 lin. longum, segmentis linearibus. Capsula globosa 2 lin. longa, seminibus in loculo tribus. *Pungo Andongo, in umbrosis ad cataractas rupium ipsius Præsidii.* Floret Nov.

22*. C. debile, Baker. Fibræ radicales 2 poll. longæ graciles vel incrassatæ. Folia radicalia plura petiolata; petiolus 1–3-pollicaris; lamina lanceolata membranacea glauco-viridis glabra 2–4 poll. longa 3–4 lin. lata e medio ad basin et apicem angustata, venis perspicuis 10–12 prædita. Scapi brevissimi 2–3ni. Racemus simplex laxissimus 2–6-pollicaris sæpe deflexus, internodiis inferioribus 9–12 lin. longis, bracteis lanceolatis viridibus cuspidatis 3–4 lin. longis, pedicelliis 1–2 lin. longis medio articulatis solitariis vel geminis. Perianthium albo-viridulum 2 lin. longum, segmentis linearibus. Capsula depresso-globosa 3 lin. longa. *Congo; Ambriz, ad rupes.* Floret Nov.

26*. C. andongense, Baker. Fibræ radicales cylindricæ 3–4 poll. longæ. Folia radicalia 5–6 sessilia lorata suberecta glabra pedalia vel sesquipedalia medio 6–15 lin. lata chartacea, venis circiter 20, marginibus albidis. Scapus pedalis et ultra. Panicula deltoidea 1–2-pedalis, ramis erecto-patentibus, bracteis deltoideis cuspidatis 2–3 lin. longis, racemis laxis, pedicellis 3–6nis 6–9 lin. longis, medio articulatis. Perianthium albido-viridulum 6 lin. longum, segmentis oblanceolatis dorso 5–6-nervatis. Stamina perianthio paulo breviora, filamentis subulatis. Capsula dura globosa 4–5 lin. longa, seminibus in loculo 3–4. *Pungo Andongo, in dumetis rupestribus omnibus Præsidii.* Floret Dec.

30. C. stenopetalum, Baker. *C. bracteosum*, Welw. Herb. *Huilla, in sylvis* Protearum *ad Lopollo.* Floret Dec.

BULBINE, Linn. (Journ. Linn. Soc. xv. 341.)

B. ASPHODELOIDES, Schult. fil. *Pungo Andongo et Huilla, regio temperata, in sylvis clarioribus subarenosis.* Floret Dec. = Liliacea, No. 14, Welw. Apont. p. 592.

ERIOSPERMUM, Jacq. (Journ. Linn. Soc. xv. 262.)

4*. E. STENOPHYLLUM, Welw. Herb. Tuber depresso-globosum sat magnum setis densis coronatum. Folia solitaria synanthia petiolata; petiolus 1–2-pollicaris; lamina linearis glabra subcoriacea erecta crebre nervata 6–8 poll. longa 2½–3 lin. lata, a medio ad apicem et basin sensim attenuata. Scapus gracilis semipedalis. Racemus laxus 5–6-pollicaris, bracteis minutis deltoideis, pedicellis erecto-patentibus, inferioribus 3–3½ poll. longis, superioribus sensim brevioribus. Perianthium 2 lin. longum infundibulare albidum, segmentis ligulatis purpureo-brunneo vittatis. Stamina perianthio triente breviora, filamentis subulatis, antheris minutis subglobosis. Ovarium globosum sessile. *Pungo Andongo, ad ripas fluminis Cumanza, in arenosis dumetosis.* Floret Martio.

4*. E. ANDONGENSE, Welw. Herb. Tuber globosum 1–1½ poll. crassum, setis coronatum. Folia solitaria hysteranthia petiolata; petiolus 2–3-pollicaris; lamina subcoriacea oblanceolata glabra 6–8 poll. longa 1–1½ poll. lata, a medio ad petiolum angustata. Scapi 1–2 palmares vel pedales. Racemi laxi 2–4-pollicares, pedicellis elongatis. Perianthium sulphureum, segmentis purpureo vittatis. Stamina inclusa, 3 interiora breviora. Ovarium sessile ovoideo-trigonum. *Pungo Andongo, in dumetis frequens.* Floret Nov.

12*. E. FLEXUOSUM, Welw. Herb. Tuber globosum 6–12 lin. crassum. Folia hysteranthia non vidi. Scapus flexuosus 6–9-pollicaris. Racemus laxus 6–9-pollicaris 20–30-florus, rachi flexuosa, pedicellis erecto-patentibus, inferioribus 2–2½ poll. longis, superioribus sensim brevioribus, bracteis minutis deltoideis. Perianthium campanulatum 3 lin. longum, segmentis ligulatis albis purpureo vittatis. Filamenta linearia perianthio triente breviora. *Huilla, regio temperata, in pascuis humidiusculis inter Lopollo et Humpata.* Floret Nov.

15*. E. PALUDOSUM, Baker. Tuber oblongum vel globosum 9–12 lin. crassum, intus sanguineo-purpureum, fibris densis intertextis persistentibus coronatum. Folia 1–3 synanthia breviter petiolata coriacea glauco-viridia glabra lanceolata vel oblonga 1–2 poll. longa, 6–9 lin. lata, basi rotundata vel subcuneata. Scapus gracilis 4–6-pollicaris. Racemus laxus 3–4-pollicaris, bracteis minutis deltoideis, pedicellis capillaribus ascendentibus 6–12 lin. longis. Perianthium campanulatum 2 lin. longum, segmentis albidis rubro-purpureo vittatis. Filamenta subulata perianthio triente breviora, antheris oblongis minutis. Capsula oblonga perianthio æquilonga. *Pungo Andongo, frequens in paludosis.* Floret Jan.–Mart.

15*. Eriospermum ophioglossoides, Welw. Herb. Tuber globosum, apice fibris copiosis intertextis coronatum. Folia 1–2 synanthia lanceolata glabra coriacea glauco-viridia lanceolata breviter petiolata 1–3 poll. lata, 6–7 lin. longa, basi cuneata. Scapus semipedalis. Racemus laxus 3–4 poll. longus, bracteis minutis deltoideis, pedicellis erecto-patentibus, inferioribus 6–9 lin. longis. Perianthium 3 lin. longum sulphureum, segmentis fusco-purpureo vittatis. Filamenta subulata perianthio triente breviora, antheris minutis oblongis flavis. Stylus filiformis 1 lin. longus. *Huilla, regio temperata, in pascuis humidiusculis.* Floret Nov.

Allium, Linn.

A. (Rhiziridium) angolense, Baker. Bulbi cæspitosi anguste ovoidei 3 poll. longi, 6–9 lin. lati, tunicis brunneis membranaceis. Folia 6–8 erecta anguste linearia glabra glauco-viridia carnoso-herbacea 6–9 poll. longa $1\frac{1}{2}$ lin. lata. Scapus validus pedalis et ultra, medio leviter incrassatus. Spathæ valvæ 2 deltoidæ 3–4 lin. longæ. Umbella densa globosa 2 poll. lata, pedicellis 6–9 lin. longis. Perianthium album campanulatum 2 lin. longum, segmentis oblongis fusco vittatis. Stamina perianthio æquilonga, filamentis conformibus subulatis. *Golungo Alto, in herbidis.* Floret Maio.

Gloriosa, Linn.

G. superba, Linn. *Angola.*

G. virescens, Lindl. *Angola et Sierra Leone.*

Sandersonia, Hook.

S. littonioides, Welw. Herb. Tuber carnosum *Gloriosæ.* Caulis sesquipedalis erectus, dimidio inferiore nudo flexuoso, superiore recto crebre foliato. Folia oblonga acuta subcoriacea viridia amplexicaulia subtiliter nervata 2–4 poll. longa, 1 poll. lata, apice haud cirrosa. Flores ex axillis foliorum superiorum producti solitarii, pedicellis cernuis 1–2 poll. longis. Perianthium aurantiaco-purpureum 9 lin. longum, segmentis lanceolatis maculis atropurpureis tessellatis, basi nectario saccatis. Stamina perianthio duplo breviora, filamentis filiformibus profunde perigynis, antheris versatilibus $1\frac{1}{2}$ lin. longis. Ovarium oblongum 3–4 lin. longum, apice obtuse lobatum; stylus erectus ovario æquilongus, apice tricuspidatus. *Pungo Andongo, in sylvis, alt.* 2400–3800 *pedum.* Habitus *Epipactis latifoliæ.*

Walleria, Kirk.

W. angolensis, Baker. Tuber carnosum difforme. Caulis rectus pedalis vel sesquipedalis, prope basin nudus. Folia 20–30 lanceolata erecto-patentia sessilia modice firma acuminata 3–4 poll. longa 3–6 lin. lata. Pedicelli ex axillis foliorum multorum producti, sæpissime simplices 12–18 lin. longi, raro furcati, ad furcam bractea lanceolata instructi. Perianthium 6–9 lin. longum intense cyaneum, seg-

mentis lanceolatis acutis per totam latitudinem laxe nervatis. Stamina perianthio paulo breviora, antheris linearibus 4 lin. longis. Ovarium basi inferum, loculis 4–7-ovulatis. Capsula cernua. *Huilla, in collinis petrosis, alt.* 3800–5500 *pedum.*

Intermediate between *W. nutans* and *W. Mackenzii* of Zambesi-land. They may likely prove all three, as Dr. Welwitsch suggested to me, varieties of a single species.

Haworthia, Duval.

H. angolensis, Baker. Bulbus squamis fuscis carnosis ovato-lanceolatis 15–18 lin. longis dense imbricatis præditus, fibris radicalibus cæspitosis carnosis. Folia 6–12 synanthia rosulata erecta linearia 2–3 poll. longa glauca planiuscula, margine serrulata, dentibus minutis retrorsis. Scapus semipedalis. Racemus subspicatus laxus 4–5-pollicaris, floribus erecto-patentibus, bracteis deltoideis cuspidatis 3 lin. longis. Perianthium 6 lin. longum, segmentis ligulatis obtusis late viridi vittatis tubo multo brevioribus. *Huilla, regio subtemperata, in dumetis arenosis.* Floret Nov.

Aloë, Linn.

A. angolensis, Baker. Subacaulis. Folia dense rosulata ensiformia bipedalia glauca immaculata 15–24 lin. lata acuminata, dentibus deltoideis patulis corneis 1 lin. longis. Scapus bipedalis, valde compressus, basi 1 poll. crassus. Racemi 1–3 densi 3–4 poll. longi, pedicellis $1\frac{1}{2}$–3 lin. longis, bracteis deltoideo-lanceolatis, floribus inferioribus deflexis. Perianthium sulphureum 9–10 lin. longum. Stamina inclusa. *Burro do Bengo, in collinis sylvaticis.* Floret Julio.

A. andongensis, Baker. Caulis 1–2-pedalis 2- vel 3-partitus, ramis ascendentibus. Folia dense rosulata lanceolata glauca immaculata arcuato-recurvata 8–9 poll. longa, basi 15–18 lin. lata, dentibus parvis deltoideis cuspidatis corneis armata. Panicula deltoidea, racemis densis 2–3 poll. longis, pedicellis 3–4 lin. longis, bracteis lanceolatis pedicello æquilongis. Perianthium 7–8 lin. longum luteo-rubrum. Stamina inclusa. *Pungo Andongo, in rupestribus frequens.* Floret Jan.–April.

A. littoralis, Baker. Arborescens 6–10-pedalis, trunco sæpissime simplici, brachii, rarius femoris humani crassitie. Folia dense rosulata ensiformia 2–3-pedalia acuminata immaculata 2–$2\frac{1}{2}$ poll. lata, dentibus patulis corneis lanceolatis vel deltoideis 1 lin. longis armata. Scapus 4–5-pedalis, sursum paniculatus. Racemi pedales modice densi, pedicellis 3–4 lin. longis, bracteis lanceolato-deltoideis 4–6 lin. longis, inferioribus reflexis. Perianthium 1 poll. longum. Stamina demum leviter exserta. *Loanda, totius regionis littoralis in collinis aridis frequens.* Floret Maio–Julium.

A. palmiformis, Baker. Fruticescens, caule 3–5-pedali, basi simplici, interdum superne ramoso. Folia dense rosulata ensiformia glauco-viridia immaculata pedalia et ultra, basi 21–24 lin. lata, dentibus deltoideis corneis patulis crebris 2 lin. longis armata. Scapus simplex vel ramosus, racemis modice densis 50–60-floris 6–8 poll. longis,

floribus inferioribus cernuis, pedicellis 3–6 lin. longis, bracteis minutis deltoideis cuspidatis. Perianthium splendide rubrum 9–10 lin. longum. Stamina inclusa. *Huilla, regio subtemperata, in petrosis sylvaticis editioribus, Morro do Lopollo.* Floret Aprili. Cum tribus præcedentibus ad stirpem *A. abyssinicæ* referendum.

Aloë zebrina, Baker. Breviter caulescens, caule simplici semipedali 1–2 poll. crasso. Folia dense rosulata patula lanceolata acuminata glauca albo-lineata et maculis albis inordinate seriatis utrinque decorata semipedalia vel pedalia, basi $1\frac{1}{2}$–2 poll. lata, dentibus deltoideis corneis $1\frac{1}{2}$–2 lin. longis armata. Scapus 3–4-pedalis, sursum paniculatus, racemis laxis 6–12 poll. longis, pedicellis 3–6 lin. longis, bracteis lanceolatis acuminatis 3–4 lin. longis. Perianthium lateritium 9–12 lin. longum. Stamina inclusa. *Barro do Bengo, Loanda et Lebongo.* Ad *A. pictam* capensem affinis.

A. platyphylla, Baker. Breviter caulescens, caule simplici semipedali vel pedali. Folia dense rosulata ovato-lanceolata acuminata glauco-viridia dense lineata et albo-maculata semipedalia, basi $2\frac{1}{2}$–3 poll. lata, dentibus deltoideis crebris corneis $1\frac{1}{2}$ lin. longis armata. Scapus 3–4-pedalis, racemis laxis semipedalibus vel pedalibus, bracteis lanceolatis, pedicellis 5–6 lin. longis. Perianthium rubrum 12–15 lin. longum. Stamina inclusa. *Pungo Andongo, in dumetis siccis frequens.* Floret Aprili. An sit varietas latifolia grandiflora prioris?

Order Smilaceæ.

Smilax, Linn.

S. Kraussiana, *Hochst.* *Huilla, Ambaca, Benguella et Golungo Alto.* Floret Feb.

Order Hæmadoraceæ.

Xerophyta, Commers.

X. capillaris, Baker. (Plate XXXVI. fig. 1). *Vellosia* (*Ophiothamna*) *capillaris*, Welw. Herb. Arbuscula, ramulis lignosis 5–6 lin. crassis, basibus foliorum delapsorum brunneis truncatis crebre nervatis. Folia ad rosulam producta 4–8 linearia longe aristata coriacea glabra 4–6 poll. longa 3 lin. lata crebre nervata. Pedicelli cæspitosi 2–3 poll. longi dense atro-viscosi. Ovarium turbinatum 3 lin. longum dense atro-viscosum. Perianthium albidum 15–18 lin. longum, segmentis lanceolatis acuminatis basi 3 lin. latis. Antheræ lineares 5–6 lin. longæ, filamento brevissimo. Capsula oblonga 5–6 lin. lata dense viscosa. *Huilla, in dumetis editioribus ad sylvas de Monino et in alta planitie de Empalanca, alt.* 3800–5500 *pedum.*

X. squarrosa, Baker. *Vellosia* (*Ophiothamna*) *squarrosa*, Welw. Herb. Frutex 3–4-rarius 5-pedalis, trunco basi $1\frac{1}{2}$–2 poll. crasso, basibus foliorum delapsorum sæpe

squarrosis. Folia producta linearia acuminata coriacea 5–6 poll. longa 5 lin. lata, marginibus superne denticulatis. Pedunculi uniflori 4–5 poll. longi superne dense viscosi. Ovarium clavatum 4-4½ lin. longum densissime atro-viscosum. Perianthii limbus 9–12 lin. longus, segmentis lanceolatis albo-cæruleis. Antheræ lineares subsessiles, perianthio duplo breviora. Capsula oblonga crustacea densissime atro-viscosa ½ poll. crassa. *Pungo Andongo, in declivis rupestribus editioribus ipsius Præsidii gregaria.*

Xerophyta velutina, Baker. *Vellosia* (*Ophiothamna*) *velutina*, Welw. Herb. Frutex erectus 1½–2½-pedalis, ramis 6–9 lin. crassus, basibus foliorum delapsorum rigidis adpressis truncatis mucronatis. Folia producta ad rosulam 8–10 linearia vel lanceolata 6–10 poll. longa 3–6 lin. lata coriacea crebre nervata distincte costata utrinque subtiliter pilosa. Pedunculi 1½–2 poll. longi, sursum atro-viscosi. Ovarium clavatum 3 lin. longum dense atro-viscosum. Perianthii limbus pollicaris cæruleus, segmentis lanceolatis acuminatis. Stamina perianthio subduplo breviora, antheris linearibus, filamentis brevissimis. *Pungo Andongo, alt.* 2400–3800 *pedum, in rupestribus arenoso-schistosis juxta ripas fluminis Cuanza gregaria, sed rarius florifera.*

X. stenophylla, Baker. *Vellosia* (*Ophiothamna*) *stenophylla*, Welw. Herb. Fruticosa, ramis 6–9 lin. crassus, basibus foliorum delapsorum rigidis adpressis crebre nervatis apice truncatis eroso-dentatis. Folia ad rosulam 6–8 rigidissima triquetra facie canaliculata 6–8 poll. longa 1–1½ lin. lata glabra acuminata creberrime nervata dorso scabridula. Flores non vidi. *Mossamedes, in montosis petrosis arenoso-schistosis prope Cazemba, dense gregaria.*

Order Hypoxidaceæ.

Hypoxis, Linn.

H. angustifolia, Lam. *Pungo Andongo et Huilla, regio temperata, in herbidis arenosis.*

H. cuanzensis, Welw. Herb. Tuber perenne 1½–2 poll. longum, 1 poll. crassum fibris setosis coronatum. Folia 8–10 linearia rigida parce pilosa distincte multinervata pedalia vel sesquipedalia 2 lin. lata. Scapi 2–4ni 3–4-pollicares. Corymbus 3–4-florus, bracteis setaceis pilosis 5–6 lin. longis, pedicellis 2–3 lin. longis. Ovarium turbinatum 1½ lin. longum, pilis brunneis vestitum. Perianthii limbus luteus 3 lin. longus, segmentis exterioribus dorso pilosis. *Pungo Andongo, in pratis humidis.* Floret Martio.

H. canaliculata, Baker. Tuber perenne oblongum 9–12 lin. crassum, fibris et squamis brunneis coronatum. Folia plura rigida erecta subteretia facie canaliculata 3–6 poll. longa ½ lin. lata, supra basin glabra contorta. Scapi 6–8 graciles albo-pilosi biflori 1–1½ poll. longi. Pedicelli 2–3 lin. longi dense pilosi, bracteis minutis subulatis

suffulti. Ovarium turbinatum 2 lin. longum, pilis albis dense vestitum. Perianthii limbus luteus 4 lin. longus, segmentis exterioribus dorso pilosis. Stamina perianthio duplo breviora. Capsula medio circumscissa. *Huilla, regio subtemperata, in pascuis collinis arenosis prope Lopollo, frequens.* Floret Dec.–Jan.

Hypoxis monanthos, Baker. Tuber perenne oblongum 3 lin. crassum, fibris radicalibus carnosis. Folia 4–5 anguste linearia parce albo-pilosa 4–5 poll. longa, basi $\frac{1}{2}$–1 lin. lata. Pedunculi uniflori 1–3ni $1\frac{1}{2}$–2 poll. longi parce pilosi gracillimi. Ovarium turbinatum 1 lin. longum subtiliter pilosum. Perianthii limbus luteus 2 lin. longus, segmentis exterioribus dorso viridulis subtiliter pilosis. Genitalia limbo duplo breviora. Capsula oblonga 3 lin. longa. *Huilla, regio temperata, in herbidis prope rivulum de Lopollo.* Floret Dec.

H. angolensis, Baker. Tuber perenne oblongum 3 poll. longum, 1–$1\frac{1}{2}$ poll. crassum, setis densis sæpe coronatum. Folia 6–8 linearia rigida acuminata 6–9 poll. longa 2–3 lin. lata, ad margines et costam faciei inferioris solum albo-pilosa. Pedunculi 1–4ni 3–6 poll. longi, pilis albidis ascendentibus vestiti. Flores 6–8 in racemum 3–4 poll. longum dispositi, bracteis linearibus 3–6 lin. longis, pedicellis 3–6 lin. longis. Ovarium turbinatum 3 lin. longum, pilis densis albis ascendentibus vestitum. Perianthii limbus luteus 6 lin. longus, segmentis interioribus oblongis, exterioribus lanceolatis dorso dense pilosis. Stamina perianthio duplo breviora, antheris lanceolatis sagittatis, filamentis deltoideis brevissimis. *Huilla, regio subtemperata, in collinis dumetosis prope Lopollo, frequens.* Floret Oct.–Nov.

H. polystachya, Welw. Herb. Tuber globosum vel depresso-globosum 3 poll. longum, basibus membranaceis brunneis foliorum delapsorum coronatum. Folia 10–12 rigida ensiformia pedalia vel sesquipedalia acuminata medio 8–9 lin. lata, facie glabra, dorso tenuiter pilosa. Pedunculi 6–8ni crassi 4–6 poll. longi. Racemus densus 20–30-florus 3–4-pollicaris, pedicellis 6–12 lin. longis, bracteis subulatis sericeis 6–9 lin. longis. Ovarium turbinatum 3 lin. longum breviter albo-pilosum. Perianthii limbus luteus 6 lin. longus, segmentis exterioribus dorso tenuiter pilosis. Stamina limbo duplo breviora, antheris basi sagittatis filamentis longioribus. Capsula sub apicem circumscissa. *Huilla, in collinis dumetosis inter Lopollo et Catumba.* Floret Dec.

Var. andongensis, Baker. Folia angustiora 5–6 lin. lata, dorso dense albo-pilosa. Pedunculus compressus sesquipedalis. *Pungo Andongo.*

Curculigo, Gaertn.

C. gallabatensis, Schweinf. Pl. Callab. Exsic. no. 39. Tuber oblongum perenne 2 poll. longum, 6–9 lin. crassum, fibris radicalibus carnosis. Folia producta 3 lanceolata erecta subpetiolata plicata utrinque tenuiter pilosa pedalia, medio 6–10 lin. lata.

Flores radicales, singuli bracteis binis linearibus vel lanceolatis 15–18 lin. longis præditi, ovario piloso cylindrico, tubo supra ovarium filiformi 15–18 lin. longo, limbo luteo 4 lin. longo, segmentis lanceolatis, exterioribus dorso pilosis. Genitalia limbo triente breviora. Stylus complanatus apice stigmatoso-capitatus. Bacca oblonga 5–6 lin. longa. *Golungo Alto, ad dumetorum margines ad Queta.* Floret Nov.

May prove a variety of *Gethyllis pilosa*, Schum. & Thonn. Pl. Guin. 172, of which we have specimens at Kew gathered by Barter.

Order Iridaceæ.

Gladiolus, Linn.

G. cærulescens, Baker. Bulbus globosus 8–9 lin. longus, tunicis crassis verticaliter scissis. Caulis gracilis sesquipedalis. Folia 3–4 distantia superposita, infimum productum lineare acuminatum rigidum glabrum 3–4 poll. longum 1 lin. latum, superiora rudimentaria brevissima. Spica laxa secunda 2–3-flora, spathæ valvis oblongis obtusis 6–8 lin. longis viridibus margine membranaceis, interiore paulo minore. Perianthium sordide cærulescens, tubo curvato 5–6 lin. longo, limbo horizontali tubo æquilongo, segmentis superioribus oblongis obtusis 3–4 lin. latis, inferioribus angustioribus lanceolatis. Genitalia limbo subæquilonga, antheris 3 lin. longis. *Huilla, regio subtemperata, in cultis anno elapso adhuc dumetis sylvestribus, ad Lopollo.*

G. luridus, Welw. Herb. Bulbus globosus 1 poll. crassus, fibris deorsum parallelis, superne reticulatis. Caulis gracilis pedalis. Folia basalia subcontigua 3–4 anguste linearia rigida glabra acuminata 1 lin. lata. Inflorescentia simplex vel ramosa. Spica secunda 3–7-pollicaris, spathæ valvis lanceolatis viridibus purpureo tinctis 6–8 lin. longis, interiore paulo minore. Perianthii cærulei tubus 5–6 lin. longus curvatus, limbo horizontali tubo æquilongo, segmentis superioribus oblongo-spathulatis obtusis 3–4 lin. latis, inferioribus magis unguiculatis. Genitalia limbo æquilonga, antheris 3 lin. longis. *Huilla, regio subtemperata, in arvis* Zeæ Maydis *prope Lopollo.* "Color florum exacte sicut in *Iride lurida*," Welw.

G. brevicaulis, Baker. Bulbus globosus 1 poll. crassus, tunicis subtiliter fibrosis. Folia rosularum basalium 3 anguste linearia firma glabra semipedalia vel pedalia 3–4 lin. lata. Caulis 6–8-pollicaris, foliis paucis superpositis valde reductis solum præditus. Spica simplex secunda 6–9-pollicaris 6–15-flora, sursum subdensa, spathæ valvis lanceolatis acutis viridibus 6–9 lin. longis margine scariosis, interiore paulo minore. Perianthium violaceo-purpureum, tubo semipollicari, limbo horizontali pollicari, segmentis superioribus oblongo-spathulatis obtusis 5–6 lin. latis, inferioribus obovato-unguiculatis. Stamina perianthio triente breviora, antheris

4 lin. longis. *Huilla, regio temperata, in pratis arenosis subhumidis inter Lopollo et Humputa, frequens.* Floret Dec.–Jan.

Habitus *G. imbricati* et *G. palustris* europæi.

Gladiolus laxiflorus, Baker. Bulbus globosus 6–9 lin. crassus, tunicis brunneis membranaceis. Folia glabra linearia falcata rigide coriacea 6–15 poll. longa 3–4 lin. lata, nervis et marginibus stramineis incrassatis. Inflorescentia simplex vel furcata. Spica laxissima 4–8-pollicaris pauciflora, rachi flexuosa, internodiis inferioribus $1\frac{1}{2}$–2 poll. longis, spathæ valvis 6–9 lin. longis purpureo tinctis acutis vel subobtusis. Perianthium læte roseo-purpureum, tubo curvato semipollicari, limbo pollicari horizontali, segmentis oblongo-spathulatis obtusis subæqualibus 3–4 lin. latis. Genitalia limbo paulo breviora. Capsula obovoidea 8–9 lin. longa. *Huilla, in pratis paludosis alte herbidis, imprimis circa stagna juxta rivum de Lopollo.* Floret Dec.

Habitus etiam *G. imbricati* europæi.

G. gregarius, Welw. Herb. Bulbus globosus 8–9 lin. crassus, tunicis subtiliter fibrosis contextis. Folia subbasalia rosulata 5–6 linearia glabra 6–9 poll. longa, 3 lin. lata. Caulis pedalis vel sesquipedalis. Spica simplex secunda erecta striata 5–8-pollicaris 10–12-flora, spathæ valvis lanceolatis, exteriore pollicari vel sesquipollicari, interiore minore. Perianthium luteum, intus ad faucem maculis parvis 2 violaceis guttatum, tubo semipollicari curvato, limbi 9 lin. longi segmentis superioribus oblongo-spathulatis 4–$4\frac{1}{2}$ lin. latis, inferioribus oblongo-unguiculatis. Genitalia limbo paulo breviora, antheris 4 lin. longis. *Pungo Andongo, in rupestribus editioribus de Serra de Pedras de Guinga.* Floret Jan.–Martium. "Crescit cæspitosus, bulbis 4–10 dense gregatis." Welw.

G. benguellensis, Baker. Bulbus globosus longe rhizomatosus, tunicis brunneis membranaceis. Folia basalia subrosulata anguste ensiformia dura glabra 6–9 poll. longa 6–8 lin. lata, nervis et marginibus crassis stramineis. Caulis pedalis et ultra, foliis 2–3 reductis præditus. Spica laxa secunda 6–8-flora 6–8-pollicaris, spathæ valvis brunneis scariosis lanceolatis acutis 9–15 lin. longis. Perianthium splendide rubrum, fauce aurantiaco-purpureo maculatum, tubo curvato 8–9 lin. longo, limbi segmentis 9–12 lin. longis horizontalibus, segmentis superioribus ovatis acutis 6 lin. latis, inferioribus lanceolato-spathulatis flore expanso deflexis. Genitalia perianthio paulo breviora. Capsula (immatura) oblongo-clavata 8–9 lin. longa. *Huilla, regio temperata, in pascuis dumetosis siccioribus prope Lopollo.* Dec.–Feb. Bulbus rhizomatosus more *Lilii canadensis.*

G. Welwitschii, Baker. *G. splendens*, Welw. Herb., non Baker in Trimen Journ. 1876, 333. Bulbus globosus 15–18 lin. crassus, tunicis fibrosis. Folia rosularum basalium haud floriferarum linearia acuminata glabra rigide coriacea 9–15 poll. longa 3–4 lin. lata, nervis et marginibus crassis stramineis. Caulis semipedalis,

foliis rudimentariis solum præditus. Spica laxa secunda 6–10-pollicaris, spathæ valvis lanceolatis acutis $1\frac{1}{2}$–2 poll. longis purpureo tinctis, interiore minore. Perianthium splendide rubro-aurantiacum, fauce maculatum, tubo curvato sesquipollicari, limbi bipollicaris segmentis superioribus horizontalibus ovatis acutis 10–12 lin. latis, inferioribus lanceolatis deflexis. Genitalia limbo paulo breviora, antheris 5–6 lin. longis. Capsula obovoideo-oblonga 15 lin. longa, seminibus oblongis late alatis. *Huilla, regio temperata, in collinis dumetosis argillaceo-arenosis circa Lopollo.* Floret Oct.–Nov.

Gladiolus multiflorus, Baker. Bulbus globosus 12–18 lin. crassus, tunicis fibroso-crispatis. Folia basalia rosulato-disticha ensiformia modice firma 9–12 poll. longa 6–9 lin. lata, nervis vix incrassatis. Caulis pedalis. Spica densa stricta secunda pedalis, spathæ valvis brunneis lanceolatis acutis 10–12 lin. longis. Perianthium rubro-purpureum, fauce pallidiore, tubo semipollicari abrupte curvato, limbo 9–10 lin. longo, segmentis superioribus brevioribus oblongo-spathulatis, inferioribus longioribus oblanceolato-unguiculatis. Genitalia limbo vix breviora, antheris 3 lin. longis. Capsula clavata 8–9 lin. longa. *Huilla, regio temperata, in sylvis,* Protearum, *loco dicto Monino, cæspitosis.* Floret Feb. Ad *G. spicatum,* Klatt, accedens.

G. angolensis, Welw. Herb. Bulbus globosus 12–18 lin. crassus, tunicis fibris parallelis præditis. Folia superposita linearia vel ensiformia glabra rigide coriacea, inferiora sesquipedalia vel bipedalia 6–9 lin. lata, nervis et marginibus stramineis incrassatis. Caulis 3–4-pedalis et ultra. Spica laxa secunda 6–18-pollicaris, spathæ valvis brunneis lanceolatis acutis $1\frac{1}{2}$–2 poll. longis, interiore paulo minore. Perianthium luteum dense rubro maculatum, tubo curvato sesquipollicari, limbi horizontalis 18–21 lin. longi segmentis superioribus oblongo-spathulatis, superiore maximo dorso convexo 12–15 lin. lato, inferioribus minoribus flore expanso decurvatis, omnibus obtusis. Genitalia limbo triente breviora. Capsula clavata 15–18 lin. longa ad basin trivalvis, valvis persistentibus divaricatis. *Golungo Alto et Pungo Andongo, in graminosis frequens.* Floret Feb.

Ad *G. psittacinum* accedens. Præterea legit Monteiro.

G. quartinianus, A. Rich. *Huilla, regio temperata, in pratis sylvaticis inter Lopollo et lacum Ivantella.* Floret Dec.

G. andongensis, Welw. Herb. Bulbus globosus 1 poll. crassus, tunicis brunneis fibris parallelis præditis. Folia ensiformia rigide coriacea acuta pedalia 10–12 lin. lata, nervis et marginibus crassis stramineis. Caulis subpedalis. Spica laxa 6–8-pollicaris, spathæ valvis lanceolatis acutis brunneis 12–18 lin. longis. Perianthium aurantiacum, tubo curvato 15 lin. longo, limbi sesquipollicaris segmentis superioribus oblongo-spathulatis horizontalibus, superiore maximo dorso convexo 10–12 lin. lato, inferioribus minoribus decurvatis. *Pungo Andongo, alt.* 2400–3800 *pedum, in rupestribus editioribus ipsius Præsidii.* Floret Dec.

ANTHOLYZA, Linn.

A. HUILLENSIS, Welw. Herb. Bulbus globosus 9–12 lin. crassus, tunicis pallide brunneis sursum membranaceis deorsum fibris parallelis præditis. Caulis 6–15-pollicaris, foliis 3 superpositis lineari-subulatis, inferiore 3–4 poll. longo, præditus. Spica 4–8-pollicaris laxa secunda, spathæ valvis brunneis obtusis 6–7 lin. longis. Perianthium splendide rubrum, tubo pollicari dimidio superiore cylindrico, limbi segmento superiore oblongo-spathulato 8–9 lin. longo, lateralibus superioribus oblongis 3 lin. longis, tribus inferioribus parvis lanceolatis. Genitalia segmento superiore paulo breviora. Capsula obovoideo-oblonga semipollicaris, seminibus discoideis distincte alatis. *Huilla, regio temperata, in dumetis arenoso-petrosis apricis inter Lopollo et Humpata.*

Ad *A. Cunoniam* accedens.

ARISTEA, Soland.

A. ANGOLENSIS, Baker. Folia basalia linearia distiche rosulata 6–9 poll. longa 3–4½ lin. lata glabra crebre nervata. Caulis simplex anceps pedalis vel sesquipedalis, foliis pluribus basalibus similibus præditus. Inflorescentia pedalis anguste paniculata, floribus multis in capitulum confertis, capitulis terminalibus pedunculatis, lateralibus sessilibus, bracteis deltoideis membranaceis 3–4 lin. longis, exterioribus longioribus, dorso firmulis. Perianthii cærulei limbus cæruleus semipollicaris, segmentis post anthesin contortis. Capsula sessilis oblonga 3 lin. longa. *Huilla, alt.* 3800–5500 *pedum, in pratis herbidis juxta ripas rivi de Lopollo.* Floret Febr.–Maium.

MORÆA, Linn.

M. TEXTILIS, Baker. *Iridopsis textilis*, Welw. Herb. Bulbus globosus 1½–2 poll. latus, tunicis multis, fibris atris duris præditis. Folium basale lineare solitarium glabrum rigidum distincte multinervatum 4–5-pedale 4½–6 lin. latum. Caulis teres 2–3-pedalis simplex, foliis pluribus rudimentariis præditus. Spathæ 3–5-floræ 4–5-pollicares, valvis scariosis purpureis crebre nervatis, interiore majore. Pedicelli elongati demum exserti. Ovarium clavatum pollicare. Perianthii tubus supra ovarium nullus; limbi saturate purpurei 2½–3 poll. longi segmentis oblanceolato-spathulatis 5–6 lin. latis, exterioribus reflexis, interioribus erectis apice emarginatis. Stigmata 1½ poll. longa, cristis lanceolatis 5–6 lin. longis. Filamenta 8–9 lin. longa, dimidio inferiore monadelpha. *Huilla, alt.* 3800–5500 *pedum, in collinis dumetosis humidiusculis juxta rivum de Lopollo.* Floret Aprili.

Ad *M. diversifoliam*, Baker, abyssinicam accedens. *Iridopsis*, Welw. Herb. est stirps generis *Morææ* floribus magnis persistentibus, caulibus robustis elatis, ovario clavato.

M. WELWITSCHII, Baker. Tuber globosum 10–12 lin. crassum, tunicis brunneis rigide fibrosis supra collum longe productis. Folia linearia acuta rigida pallide viridia glabra distincte multinervata 1½–2½-pedalia, 5–6 lin. lata. Caulis pedalis simplex haud foliatus. Spathæ terminales bifloræ, valvis acutis scariosis subæqualibus

3–4 poll. longis. Pedicelli 2–4-pollicares. Ovarium clavatum pollicare. Perianthii tubus supra ovarium nullus, limbi saturate lilacini persistentis 2 poll. longi segmentis oblanceolato-spathulatis subæqualibus 5–6 lin. latis, exterioribus flore expanso falcatis, interioribus erectis. Stigmata 12–15 lin. longa, cristis lanceolatis 5–6 lin. longis. Filamenta 8–9 lin. longa, dimidio inferiore monadelpha, antheris 5–6 lin. longis. Capsula oblonga 15 lin. longa. *Huilla, regio temperata in uliginosis et paludosis juxta rivum de Lopollo.* Floret Nov. "Irides quasdam europæas perfecte ludens," Welw.

Moræa glutinosa, Baker. Tuber difforme 9–18 lin. crassum. Folia rosularum basalium haud floriferarum anguste ensiformia firma glabra pedalia 4–5 lin. lata. Caulis semipedalis, foliis 3–4 reductis præditus. Inflorescentia pedalis, ramis 3–4 elongatis ascendentibus, infra nodos viscosis. Spathæ valvæ oblongæ obtusæ virides arcte complicatæ, interior longior 12–15 lin. longa. Pedicelli spathæ æquilongi. Perianthii tubus supra ovarium nullus; limbi pollicaris fugacis lilacino-purpurei segmentis oblanceolato-spathulatis subæqualibus. Filamenta semipollicaria infra medium connata, antheris flavis 1 lin. longis. *Huilla, regio subtemperata, in collinis dumetosis prope Lopollo, cum* Clematibus *et* Tinneæ *sp.* Floret Aprili.

M. spithamæa, Baker. Tuber globosum 3–6 lin. crassum. Caulis gracilis palmaris, basi foliis 2–3 anguste linearibus rudimentariis præditus, dimidio superiore ramosus, ramis 2–3 infra nodos et spathas viscosis. Spathæ 2–3 terminales pollicares trifloræ, valvis firmis viridulis striatis, exteriore minore semipollicari. Pedicelli spathæ æquilongi. Perianthii tubus supra ovarium nullus, limbi flavi fugacis 7–9 lin. longi intus maculis nigris decorati, segmentis oblanceolato-spathulatis subæqualibus. Filamenta 4½ lin. longa prope basin connata, antheris oblongis 1 lin. longis. *Huilla, regio subtemperata, in dumetis arenosis circa Lopollo et Humpata.*

M. andongensis, Baker. Tuber parvum globosum, fibris multis gracilibus præditum, Caulis semipedalis vel pedalis, dimidio superiore ramosus, infra nodos et spathas viscosus, foliis 2 anguste linearibus glabris rigide coriaceis 6–15 poll. longis 1 lin. latis præditus, ramis paucis vel pluribus (2–8) arcuatis ascendentibus 1–3 poll. longis. Spathæ terminales 6–9 lin. longi, valva exteriore 4½–6 lin. longa. Pedicelli spathæ æquilongi. Ovarium turbinatum 1 lin. longum. Perianthii tubus supra ovarium nullus; limbi sulphureo-lutei fugacis semipollicaris segmentis oblanceolato-spathulatis subæqualibus. Filamenta 3 lin. longa supra medium connata, antheris oblongis 1 lin. longis. Capsula depresso-globosa 4 lin. lata. *Pungo Andongo, alt.* 2400–3800 *pedum, in pratis sylvaticis paludosis breviter herbidis de Montollo.*

M. Candelabrum, Baker. Tuber parvum globosum. Caulis 2–3-pedalis, dimidio superiore pinnatim ramosus, ramis gracilibus erecto-patentibus infra nodos viscosis, inferioribus compositis, ramulis ultimis strictis erectis 1–3 poll. longis. Folia plura superposita acuta firma glabra linearia pedalia 3 lin. lata. Spathæ 4–5-floræ, valvis

valde inæqualibus, interiore pollicari, exteriore obtusa 3–4 lin. longa. Pedicelli spathæ æquilongi. Ovarium turbinatum 1 lin. longum. Perianthii tubus supra ovarium nullus; limbi lilacini fugacis segmentis oblanceolato-spathulatis subæqualibus. Stamina limbo dimidio breviora, filamentis dimidio inferiore connatis, antheris oblongis. *Huilla, regio subtemperata, in fruticetis petrosis ad Morro de Lopollo, alt.* 5200 *pedum.*

Moræa gracilis, Baker. Bulbi globosi cæspitosi 5–6 lin. lati tunicis subtiliter fibroso-reticulatis. Caulis strictus gracilis simplex 8–15-pollicaris, supra basin folio unico anguste lineari præditus, infra nodos haud viscosus. Spathæ solitariæ terminales 1–6-floræ, valvis lanceolatis 2–2½ poll. longis, exteriore breviore. Pedicelli spathe demum æquilongi. Ovarium clavatum 3 lin. longum. Perianthii tubus supra ovarium nullus; limbus luteus fugax 9 lin. longus, segmentis oblanceolato-spathulatis subæqualibus. Stamina limbo duplo breviora, filamentis dimidio inferiore connatis. Capsula oblonga 4–4½ lin. longa. *Huilla, in pascuis arenosis prope Lopollo, alt.* 3800–5500 *pedum.*

Lapeyrousia, Pourret.

L. littoralis, Baker. Caulis tripollicaris valde ramosus, foliis 2 linearibus acutis firmis glabris infra inflorescentiam instructus, rachi angulosa flexuosa, spathis plerisque pedunculatis terminalibus, 1–2 lateralibus sessilibus. Spathæ valvæ semipollicares lanceolatæ viridulæ æquales. Perianthium non vidi. Capsula membranacea obovoideo-oblonga 3–4 lin. longa. *Mossamedes, in collinis sabulosis maritimis.*

L. abyssinica, Baker. *Montbretia abyssinica*, R. Br. *Pungo Andongo, alt.* 2400–3800 *pedum.*

L. cyanescens, Baker. *Psilosiphon cyanescens*, Welw. Herb. Bulbus globosus 1 poll. latus, tunicis fibris crassis præditis. Caulis infra inflorescentiam 6–9-pollicaris, foliis 3–4 anguste linearibus firmis glabris pedalibus 2 lin. latis, nervis 5–7 crassis stramineis præditis. Inflorescentia pedalis, rachi flexuosa ancipiti. Spathæ valvæ lanceolatæ æquales 15–18 lin. longæ. Perianthii tubus filiformis 4–5-pollicaris, limbi albi violaceo tincti pollicaris segmentis oblongis 4–4½ lin. latis. Genitalia limbo duplo breviora, antheris linearibus 4 lin. longis, filamentis brevissimis. *Huilla, regio subtemperata, in collinis spongiosis editis prope Humpata.*

L. fragrans, Baker. *Psilosiphon fragrans*, Welw. Herb. Bulbus ovoideus 8–9 lin. latus, tunicis crassis brunneis reticulato-fibrosis. Caulis brevissimus, foliis 2 linearibus subcoriaceis acutis profunde nervatis glabris 6–8 poll. longis 2 lin. latis instructus. Inflorescentia laxissima corymbosa 6–9 poll. longa, rachi flexuosa angulosa. Spathæ valvæ lanceolatæ subpollicares subæquales integræ acutæ. Perianthium albidum, tubo cylindrico 4–4½ poll. longo, segmentis lanceolatis acutis

J.N.Fitch lith

1-3 DIPCADI COMOSUM. 4-7 ACROSPIRA ASPHODELOIDES.

Fitch imp

J.N. Fitch lith. 1-4 DASYSTACHYS CAMPANULATA. 5-10 D. COLUBRINA Fitch imp.

JNFitch lith. 1 XEROPHYTA CAPILLARIS. 2,3. LAPEYROUSIA ODORATISSIMA. Fitch imp

9–12 lin. longis. Antheræ $4\frac{1}{2}$ lin. longæ, filamentis brevissimis. Capsula oblonga tubulosa 5–6 lin. longa. *Huilla, regio subtemperata, in rupestribus et petrosis apricis prope Lopollo.*

LAPEYROUSIA ODORATISSIMA, Baker. (Plate XXXVI. figs. 2, 3.) *Psilosiphon odoratissimus*, Welw. Herb. Bulbus ovoideus basi applanatus, tunicis brunneis coriaceis reticulatonervatis, collo 2–3-pollicari. Caulis 1–2-pollicaris, foliis 2–3 linearibus glabris erecto-patentibus 4–5 poll. longis 1 lin. latis, facie profunde canaliculatis. Spica solitaria densa multiflora. Spathæ valva exterior linearis viridis 3–5-pollicaris, interior multo minor. Perianthii albidi fragrantis tubus cylindricus 4–5-pollicaris, limbi segmentis lanceolatis 12–15 lin. longis. Antheræ ligulatæ 3 lin. longæ, filamentis brevissimis. *Huilla, regio subtemperata, in dumetis arenosis petrosis prope Lopollo.*

DESCRIPTION OF PLATES.

PLATE XXXIV.

Figs. 1 to 3. *Dipcadi comosum*, Welw. 1. Plant, of natural size. 2. Single perfect flower from the lower part of the raceme, enlarged. 3. Unexpanded raceme.

Figs. 4 to 7. *Acrospira asphodeloides*, Welw. 4. Of natural size. 5. Segment of perianth, enlarged. 6. Stamen; and 7. Pistil in section, also enlarged.

PLATE XXXV.

Figs. 1 to 6. *Dasystachys campanulata*, Baker. 1. Of natural size. 2. Segment of perianth; 3. Stamen; 4. Ovary: all magnified.

Figs. 5 to 10. *Dasystachys colubrina*, Baker. 5. Plant, of natural size. 6. Segment of perianth; 7. Stamen; 8. Ovary; 9. A horizontal section of ovary; 10. The seed: all magnified.

PLATE XXXVI.

Fig. 1. *Xerophyta capillaris*, Baker. Nat. size.

Figs. 2 & 3. *Lapeyrousia odoratissima*, Baker. Of natural size.

The above figures were drawn on stone, partly from sketches by Mrs. J. G. Baker, and partly from the objects themselves, kindly placed at the author's disposal by the Trustees of the late Dr. Welwitsch.

XVIII. *Contribution to the Lichenographia of New Zealand.* By Charles Knight, *Esq., F.L.S., Auditor-General of New Zealand.*

(Plates XXXVII., XXXVIII.)

Read March 1st, 1877.

Urceolaria novæ-zelandiæ, Kn. (Plate XXXVII. fig. 1.)

Thallus cinerascens indeterminatus leproso-areolatus v. quasi detritus. Apothecia parva immersa, disco subdepresso fusco farinaceo (margine thallode nullo) nucleo ab excipulo dimidiato-fusco cincto, paraphysibus distinctis rectis tenuibus. Sporæ in ascis cylindraceis fuscæ ovatæ murali-divisæ horizontaliter 5–6-septatæ longit. ·027 mm., crassit. ·018 mm. Ad saxa.

Pertusaria graphica, Kn. (Plate XXXVII. fig. 2.)

Thallus late effusus cartilagineus albicans v. cinereo-albicans rimuloso-areolatus, verrucis subgloboso-difformibus crebris v. confertissimis (deinde deplanatis) obsitus, gonidiis per totam partem instructus. Apothecia plura in singulis verrucis thalli inclusa (excipulo proprio prorsus nullo) primitus a thallo tecta, tandem aperta, discis irregularibus sæpe in pseudo-discum confluentibus, epithecio fusco, paraphysibus tenerrimis tortilibus. Sporæ 1næ simplices ellipsoideæ grumo-granulosæ dilute luteæ, episporio crasso, longit. ·082 mm., crassit. ·04 mm. Ad saxa.

Lecidea littoralis, Kn. (Plate XXXVII. fig. 3.)

Thallus cinereo-albidus v. cinerascens crassus continuus v. areolatus late expansus lævis. Apothecia adnata mujuscula (latit. 2·65 mm.) sparsa atra pruinosa tenuiter marginata dein tumidula et difformia, margine atro flexuoso v. lobato inciso. Sporæ simplices ellipsoideæ, longit. ·013 ad ·018 mm., crassit. ·006 mm. Hypothecium fuscum v. linea atra hypothecii latera et basin circumscribens. Ad saxa.

Lecidea subglobulata, Kn. (Plate XXXVII. fig. 4.)

Thallus cinerascens minute furfuraceo-diffractus v. squamuloso-areolatus, granulis gonimis viridibus. Apothecia immarginata interdum confluentia, disco atro convexo tandem hemisphærico v. subglobuloso. Sporæ in ascis ventricosiusculis simplices ellipsoideæ subhyalinæ tandem dilute luteæ, longit. ·013 mm. ad ·022 mm., crassit. ·007 mm. Hypothecium atrum v. fuscum. Ad saxa.

Lecidea subargillacea, Kn. (Plate XXXVII. fig. 5.)

Thallus luteo-albus continuus. Apothecia subaggregata innata v. adnata concava fusca immarginata interdum difformia sæpe furfuracea. Sporæ in ascis cylindraceis grumoso-luteæ v. hyalinæ longit. ·016 mm., crassit. ·008 mm. Hypothecium album. Ad terram argillaceam.

Syn. *Lecidea meiospora,* Nyl. (?).

LECIDEA ATRO-MORIO, Kn. (Plate XXXVII. fig. 6.)

Thallus nigro-cinerascens tenuis squamulosus, squamulis minutis rotundis planis rufescentibus nitidis ad ambitum plerumque minute furfuraceis. Apothecia atra parva plana ex hypothallo nigricante inter squamulas denudato oriunda, squamulas haud superantia, interdum margine thallino spurio granulis minutissimis cincta. Sporæ minutæ ovoideæ v. globosæ, longit. ·0065 mm., crassit. ·005 mm. Gonidia magna. Hypothecium fuscum. Ad saxa.

LECIDEA SUBLAPICIDA, Kn. (Plate XXXVII. fig. 7.)

Thallus granulosus indeterminatus cinereo-albus. Apothecia in thalli lacunis sæpissime confluentia adpressa aterrima nuda planiuscula v. concaviuscula, margine tenuissimo atro undulato, paraphysibus tenuibus conglutinatis. Sporæ in ascis ventricoso-clavatis parvulæ ovoideæ simplices hyalinæ longit. ·005 mm., crassit. ·004 mm. Stratum hypothecii subhymeniale atrum. Ad saxa.

Differs from *L. lapicida* in its smaller ovoid spores, much finer paraphyses, and black hypothecium. In *L. lapicida* the subhymenial stratum is slightly coloured, and the inferior stratum a thin black line continued from the margin.

LECIDEA NIGRESCENS, Kn.

Thallus nigro-cinerascens tenuis lævis indeterminatus. Apothecia atra minuta convexa emarginata, paraphysibus conglutinatis. Sporæ in ascis ventricoso-clavatis minutæ ovoideæ simplices hyalinæ longit. ·004 mm., crassit. ·003 mm. Stratum hypothecii subhymeniale atrum. Ad saxa.

LECIDEA SCHISTACEA, Kn. (Plate XXXVII. fig. 8.)

Thallus schistaceus determinatus tenuis squamulosus, squamulis rotundis adpressis minutissimis pruinosis hypothallo nigro. Apothecia nigra mediocria v. parva squamulas superantia marginata disco plano, margine prominente interdum undulato. Sporæ minutæ ellipsoideæ incolores, longit. ·008 mm., crassit. ·004 mm. Hypothecium nigrum. Ad saxa.

LECIDEA SUBCOARCTATA, Kn. (Plate XXXVII. fig. 9.)

Thallus cinereo-albus areolatus v. areolato-granulosus v. continuus. Apothecia conferta fusca v. atro-fusca adnata sat parva convexa, margine integerrimo pallido v. dilute fusco nudo demum evanido. Sporæ in ascis ventricoso-clavatis simplices ovoideæ incolores, longit. ·011 mm., crassit ·007 mm. Hypothecium album. Ad saxa.

Differs from *L. coarctata* in the much smaller ovoid spores, the ventricose ascus, and white hypothecium.

LECIDEA SUBBADIO-ATRA, Kn. (Plate XXXVII. fig. 10.)

Thallus fusco-cinereus rimulosus æqualis. Apothecia nigro-fusca convexa marginata, margine dilute concolori in statu juvenili prominente, demum obscurato. Sporæ

fuscæ oblongæ curvatulæ 1-septatæ, longit. ·025 mm., crassit. ·01 mm. Lamina prolifera ex hypothecio nigro duplici (strato intermedio fusco) enata. Ad saxa.

LECIDEA WHAKATIPÆ, Kn. (Plate XXXVII. fig. 11.)

Thallus albus parum visibilis v. obsolete indicatus. Apothecia parva atra, juniora plana et tenuiter marginata, dein convexa v. suborbiculata immarginata. Sporæ fuscæ ellipticæ longit. ·013 mm., crassit. ·006 mm. Hypothecium atrum.

LECIDEA STELLULATA, Tayl. (?)

Thallus albus v. cinereus tenuissimus minutissime areolatus v. granulosus hypothallo atro limitatus sæpius in agellos ab hypothallo denudato metatus. Apothecia parva subinnata confluentia atra plana tenuiter marginata, margine sæpe e granulis effusis. Sporæ in ascis ventricoso-clavatis ovatæ fuscæ 1-septatæ, longit. ·012 mm., crassit. ·006 mm. Hypothecium atrofuscum. Ad saxa.

LECIDEA SUBTUBULATA. (Plate XXXVII. fig. 12.)

Thallus *continuus fumosus* tenuissimus. Apothecia elevato-sessilia tenuiter marginata, disco plano, margine atro elevato. Sporæ in ascis clavatis *fuscæ* plerumque in medio constrictæ *nonnunquam loculis tubulo brevi junctis*, longit. ·017 mm., crassit. ·009 mm. Paraphyses distinctæ. Lamina proligera ex hypothecio *stramineo* enata; *linea atra hypothecii latera et in parte basin circumscribens.* Ad saxa.

LECIDEA PETRÆA, Flot., var. NEO-ZELANDICA, Kn. (Plate XXXVII. fig. 13.)

Thallus cinereo-plumbeus minute granulosus, ex hypothallo nigricante inter granula denudato enatus. Apothecia sat parva plana crebra, disco aterrimo nudo elevato-marginato, margine primum e granulis minutis suffusis, tandem fusco-atro. Sporæ in ascis ventricosis 3–5-septatæ, et septa transversa septulis longitudinalibus v. obliquis juncta, subhyalinæ tandem dilute fuscæ, longit. ·023 mm., crassit. ·009 mm. Hypothecium fusco-nigrum. Ad saxa.

LECIDEA PETRÆA, Flot., var. VIOLACEA. (Plate XXXVII. fig. 14.)

Thallus minute tuberculosus, tubercula violacea, hypothallo nigricante. Apothecia parva creberrima nigra innata v. adnata concaviuscula immarginata. Sporæ fuscæ 5-septatæ, septa transversa septulis longitudinalibus v. obliquis juncta, longit. ·027 mm., crassit. ·01 mm. Hypothecium atrum.

LECIDEA TUBULATA, Kn. (Plate XXXVII. fig. 15.)

Thallus granuloso-diffractus albo-cinerascens indeterminatus. Apothecia nigro marginata, disco plano pruinoso, margine atro elevato. Sporæ in ascis clavatis fuscæ biloculares, loculis tubulo brevi junctis, longit. ·018 mm., crassit. ·011 mm. Hypothecium atrum. Hypothallus albus. Ad saxa.

LECIDEA SUBFARINOSA, Kn. (Plate XXXVII. fig. 16.)

Thallus albus effusus rugulosus. Apothecia (latit. 8 mm. v. minora) albo-pruinosa rotun-

dato-difformia elevato-sessilia tenuiter marginata, margine sæpe flexuoso, paraphysibus superne fuscescentibus concretis, disco concavo vel plano vel convexo. Sporæ 4–6-septatæ aciculari-fusiformes incolores vel tandem dilute lutescentes, longit. ·034 mm., crassit. ·005 mm.

Ad cortices arborum.

L. farinosa, Ach., *L. Dillemana*, Ach., *L. abietina*, Ach., *L. premnea*, Ach., and the above-described Lichen are very closely allied. The New-Zealand Lichen approaches closely *L. abietina*, Ach., from which it differs principally in the greater number of septa, in the spores, and the smaller apothecia.

THELOTREMA SAXATILE, Kn. (Plate XXXVII. fig. 17.)

Thallus albidus v. cinereo-albidus continuus granulosus indeterminatus tenuis. Apothecia normaliter globosa in verrucis thallinis rotundatis supra planis immersa, aperturis rotundatis depressis, excipulo proprio instructa, paraphysibus capillaribus. Ascus monosporus. Sporæ dilute fuscæ tandem fusco-nigricantes fusiformes murali-divisæ, longit. ·16 mm., crassit. ·038 mm. Ad saxa.

THELOTREMA MONOSPORUM, var. PATULUM, Kn. (Plate XXXVII. fig. 18.)

Thallus luteo-albus rimoso-diffractus crassus. Apothecia verrucæformia excipulo duplici instructa, interiore membranaceo tandem lacero-dehiscente, nucleo madefacto expanso discoideo. Ascus monosporus interdum disporus (unde sporis minoribus). Sporæ fuscæ fusiformes murali-divisæ, longit. ·05 ad ·1 mm., crassit. ·015 ad ·03 mm. Ad cortices arborum.

Syn. *Thelotrema monosporum*, var. *patulum*, Nyl. in litt.

ASTROTHELIUM PYRENASTROIDES, Kn. (Plate XXXVII. fig. 19.)

Thallus effusus glauco-ochraceus v. cinereo-albescens v. olivaceus rimulosus. Apothecia convexa a thallo plus minus velata demum denudata carbonacea, loculis 2–5, ostiolis convergentibus in os commune sæpissime desinentibus, ore ochraceo, paraphysibus tenerrimis rectis v. subtortilibus. Sporæ in ascis elongato-cylindraceis incolores demum dilute fuscæ fusiformes 5–8-septatæ (vix unquam 3–4-septatæ) v. sæpius murali-divisæ v. interdum locellis medianis a septulis longitudinalibus divisis, longit. ·038 mm., crassit. ·012 mm. Ad cortices arborum.

Syn. *Verrucaria pyrenastroides*, Kn., Trans. Linn. Soc. vol. xxiii. p. 100, tab. ii.; *Astrothelium prostratum*, Stirton, Journ. Linn. Soc. vol. xiv. p. 473; *A. ochrocleistum*, Nyl., in litt. An *Trypethelium pyrenuloides*, Mont.?, *T. Cumingii*, Fee?, *T. astroidea*, Fee?, *Verrucaria Thwaitsii*, Leight.?

VERRUCARIA GEMELLIPARA, Kn. (Plate XXXVII. fig. 20.)

Thallus flavo-æneus v. flavo-olivaceus tenuissimus glaber linea nigra limitatus. Apothecia parva parum prominula, ambitu applanato, dimidiatim nigra, basi amplificata, poro pertuso instructa, paraphysibus distinctis. Sporæ obovatæ uniseptatæ sæpe in

medio subconstrictæ cellula superiore majore incolores, longit. ·017 mm., crassit. ·006 mm. Ad cortices arborum.

Syn. *Verrucaria circumpressa*, Nyl., in litt.; *V. epidermidis*, var. *gemellipara*, Kn.

VERRUCARIA MINUTISSIMA, Kn. (Plate XXXVII. fig. 21.)

Thallus atro-cinerascens tenuissimus. Apothecia contigua minutissima prominula dimidiatim nigra poro pertuso instructa, paraphysibus distinctis. Sporæ dilute fuscæ uniseptatæ (an interdum 3-septatæ?) in medio subconstrictæ, cellula superiore majore, longit. ·018 mm., crassit. ·005 mm. Ad cortices arborum.

The spores have much the appearance of a *Sphæria*; except the bright colour, not unlike those of *Verrucaria conferta*, Tayl. (Leight. Angioc. Lich.).

VERRUCARIA SUBBIFORMIS, Kn. (Plate XXXVII. fig. 22.)

Thallus albus effusus inæqualis rimosus. Apothecia subminuta prominentia (madefacta innata) nigra subglobosa integra, paraphysibus capillaribus confertis. Sporæ in ascis cylindraceis oblongæ 1-septatæ incolores, longit. ·02 mm., crassit. ·007 mm. Ad cortices arborum.

BAGGLIETTOA, Mass. (?), OCELLATA, Kn. (Plate XXXVII. fig. 23.)

Thallus fusco-cinereus continuus tenuis subglaber, gonidia magna. Apothecia in verrucis prominulis immersa interdum 2–4 confluentia, excipulo proprio carbonaceo instructa, primo punctiformia dein aperta, margine thallino albo sculpto-angulari v. sculpto-subrotundo v. irregulariter dehiscente. Nucleus globosus verrucoideus, amphithecio grumoso oriundus, paraphysibus crassis mucoso-diffluxis farctus. Sporæ in ascis curvatulis fusiformibus ellipsoideæ incolores v. luteo-grumosæ, longit. ·028 mm., crassit. ·012 mm. Ad saxa.

VERRUCARIA OCCULTA, Kn. (Plate XXXVII. fig. 24.)

Thallus crustaceus lævigatus aureus v. ochraceus v. ochraceo-albus verrucoso-colliculosus irregulariter plicato-rugulosus plus minus rimosus. Apothecia numerosissima globosa in verrucis thalli confluentibus penitus abdita, ab excipulo simplici proprio carbonaceo clausa, canaliculis ad sporas mittendas in verrucas thalli productis, ostiolis paululum depressis minutis instructa, paraphysibus distinctis capillaribus. Sporæ in ascis elongato-cylindraceis oblongo-ovoideæ 3-septatæ dilute fuscæ v. subincolores longit. ·016 mm., crassit. ·006 mm. Ad cortices arborum.

An *V. micromma*, Mont.?

VERRUCARIA PRUINO-GRISEA, Kn. (Plate XXXVII. fig. 25.)

Thallus effusus tenuis plus minus pseudo-farinaceus griseus. Apothecia minutissima dimidiata patentia. Sporæ in ascis clavatis incolores tandem fuscæ lineari-oblongæ 1-septatæ v. sæpissime interrupte quadrinucleolatæ, longit. ·02 mm., crassit. ·006 mm. Ad cortices arborum.

VERRUCARIA DEALBATA, Kn. (Plate XXXVIII. fig. 1.)

Thallus albescens tenuis effusus glaber. Apothecia nigra parva hemisphærico-conoidea dimidiata, paraphysibus distinctis. Sporæ in ascis cylindraceis dilute fuscæ ellipsoideæ 3–5-septatæ, longit. ·023 mm., crassit. ·008 mm. Ad cortices arborum.

VERRUCARIA SAXICOLA, Kn. (Plate XXXVIII. fig. 2.)

Thallus luteo-olivaceus tenuissimus v. nullus. Apothecia parvula hemisphærica, perithecio carbonaceo integro, ostiolo inconspicuo; nucleo subgloboso hyalino, paraphysibus capillaribus farcto. Sporæ in ascis elongato-cylindraceis incolores fusiformes 7–8-septatæ, longit. ·032 mm., crassit. ·005 mm. Ad saxa.

VERRUCARIA ASTATA, Kn. (Plate XXXVIII. fig. 3.)

Thallus tenuis fulvo-fuscus v. cinereo-fuscus opacus continuus indeterminatus. Apothecia nigra prominula (madefacta sæpe innata) hemisphærica integra, paraphysibus capillaribus tenerrimis distinctis. Sporæ in ascis elongato-cylindraceis ovoideæ fuscæ 3-septatæ, longit. ·04 mm., crassit. ·009 mm. Ad cortices arborum.

Probably this may be *V. aspistea*, Ach.; but there is much confusion about Acharius's plant. Nylander remarks "Esse videtur modo *V. nitida* minor, sporis minoribus." Montagne describes *V. aspistea*, Ach., "sporis magnis ellipticis 16-annulatis, annulis pauci-cellulosis;" he adds that *V. aspistea* of Eschweiler is incorrectly named, and he has therefore named Eschweiler's plant *V. Eschweileri* with "spora binucleolata." Acharius describes his Lichen as having a polished yellowish thallus, limited by a black line, in these and other characters differing from the New-Zealand Lichen.

PORINA ENDOCHRYSA, Mont. (Plate XXXVIII. fig. 4.)

Thallus late effusus tenuis fragilis colliculosis glauco-cinereus subtus bullatus. Apothecia immersa, perithecio flavescente integro normaliter globoso, ostiolo fusco depresso primum occluso demum aperto, nucleo fusco, paraphysibus filiformibus. Sporæ 8næ incolores cymbiformes murali-divisæ, longit. ·09 ad ·15 mm., crassit. ·025 ad ·04 mm., episporio crasso. Ad cortices arborum.

Syn. *Thelenella wellingtonii*, Stirton, Journ. Linn. Soc. vol. xiv. p. 473.

CHIODECTON (PLATYGRAPHA) INCONSPICUUM, Kn. & Mitt. (Plate XXXVIII. fig. 5.)

Thallus crustaceus cinereo-violaceus verrucæformis, verrucis dilute concoloribus. Apothecia minuta normaliter globosa, in verrucis thallinis rotundatis v. flexuoso-elongatis supra planiusculis immersa (passim confluentia) plura in quavis verruca unumquidque ex atro-fusco toro oriens, disco rotundo v. oblongo v. attenuato-oblongo nigro. Sporæ oblongo-fusiformes curvatulæ 3-septatæ incolores, longit. ·05 mm., crassit. ·004 mm. Ad cortices arborum.

Syn. *Chiodecton conchyliatum*, Stirton; *C. moniliatum*, Stirt.; *C. sinuosum*, Stirt.

OPEGRAPHA SAXICOLA, Ach. (Plate XXXVIII. fig. 6.)

Thallus obliteratus. Apothecia atra lirellæformia sæpe flexuosa rarius rotundo-difformia,

epithecio pliciformi v. rimæformi, marginibus parallelis v. medio paullulum distentis. Sporæ lineari-oblongæ v. lineari-clavatæ 3-septatæ dilute luteæ, longit. ·017 mm., crassit. ·006 mm. Ad saxa.

Fissurina Novæ-Zelandiæ, Kn. (Plate XXXVIII. fig. 7.)

Thallus crustaceus lævigatus ochraceus tenuiter areolatus. Apothecia immersa flexuosa lineari-elongata, fissuris a thallo marginatis conniventibus tumidulis, excipulo atrofusco crasso a thallo insuper tecto infra subito evanescente. Sporæ in ascis clavatis 5-septatæ ellipsoideæ incolores, longit. ·02 mm., crassit. ·01 mm. Ad saxa.

Melaspilea metabola, Nyl. (Lich. Novæ Caledoniæ). (Plate XXXVIII. fig. 8.)

Thallus cinereo-albidus v. cinereus diffracto-rimosus v. areolatus, tenuissimus. Apothecia nigra v. fusca parva rotundato-lecideoidea (juniora punctiformia) convexa immarginata, intus pallido-incoloria. Sporæ 2–8næ oblongo-cylindraceæ inferne magis attenuatæ et curvatulæ (sæpe in capillam productæ) murali-divisæ v. multiloculares, longit. 0·075 ad 0·1 mm., crassit. 0·01 mm. Thecæ pyriformes infra in caudam nonnihil flexuosam productæ. Hypothecium dilute fuscescens.

Syn. *Melaspilea amphorodes*, Stirton.

Phlyctis sordida, sp. nov. (Plate XXXVIII. fig. 9.)

Thallus cinereus fragilis tenuis v. crassus contiguus subgranulosus inæqualis v. corrugato-rimosus v. minutissime areolatus. Apothecia minuta rotundato-difformia, margine thallino albino-leproso cincta, disco fusco nonnihil farinoso. Sporæ 5–8-septatæ ellipsoideæ curvatæ incolores, longit. 0·06 mm., crassit. 0·007 mm. Ad corticem.

Obs. When the thallus is thin it necessarily adapts itself to the surface on which it grows, and may thus be either smooth, rugose, rimose, &c.

Phlyctis ocellata, sp. nov. (Plate XXXVIII. fig. 10.)

Thallus albido-canescens v. dilute murinus fragilis corrugato-rimosus. Apothecia minuta regularia in tuberculo innata, a thallo marginata, nucleo strato gonimo imposito, disco fusco concaviusculo. Sporæ ellipsoideæ incolores 3–6-septatæ, longit. 0·028 mm., crassit. 0·004 mm. Ad corticem.

Phlyctis Neo-Zelandiæ, sp. nov. (Plate XXXVIII. figs. 11 & 12.)

Thallus albus crassus v. tenuis rimosus fragilis lævis v. granulosus. Apothecia minuta solitaria v. aggregata innata rotundato-difformia a thallo pruinoso velata vel margine thallino albido-leproso cincta, disco dilute fusco albido-pruinoso. Sporæ in ascis obovato-clavatis normaliter 8næ curvatæ cylindraceo-ellipsoideæ, apicibus acutis v. obtusis dilute flavescentes 6–9-septatæ, longit. 0·07 mm., crassit. 0·006 mm. Paraphyses distinctæ. Ad corticem.

Obs. There is a variety with thin white granular thallus; spores cylindrical, rounded at either apex.

STICTA CANALICULATA, sp. nov.

Thallus glauco-pallescens late expansus (latit. usque pedalis) rigens vix nitidiusculus lævis lineari-laciniatus canaliculatis, laciniis insignius sinuato-pinnatifidis, subtus totus tomentosus luteo-fuscescens, cyphellæ albidæ suburceolatæ mediocres v. majusculæ. Apothecia badio-rufa v. fusca (latit. 5 mm.) margine crenulato, receptaculo granulato. Sporæ leviter fuscescentes fusiformi-oblongæ uniseptatæ, longit. 0·025 mm., crassit. 0·01 mm.

Obs. Much stouter than *S. variabilis*, and differs from *S. damæcornis* in the white larger cyphellæ, the channelled laciniæ, and the under surface entirely covered by a brown tomentum.

PLACODIUM ILLITUM, sp. nov. (Plate XXXVIII. fig. 13.)

Thallus contiguus *determinatus* fusco-cinerascens v. sordide albus arcte adnatus *lævis* v. in centro minute granulosus in ambitu *non radioso-sublobatus sed minutissime crenatus* gonimicus sæpe cephalodiis fusco-luteis radiatim onustus. Apothecia crebra v. conferta unde per mutuam pressionem tandem difformia, margine cinerascente v. albo *subinde evanescente*, disco *fusco-nigrescente* concavo per ætatem plano et marginem subæquante. Paraphyses discretæ. Sporæ in ascis elongato-cylindraceis uniserialiter octonæ luteæ ellipsoideæ, longit. ·012 mm., crassit. ·007 mm. *Hypothallus fuscus.* Ad lapides.

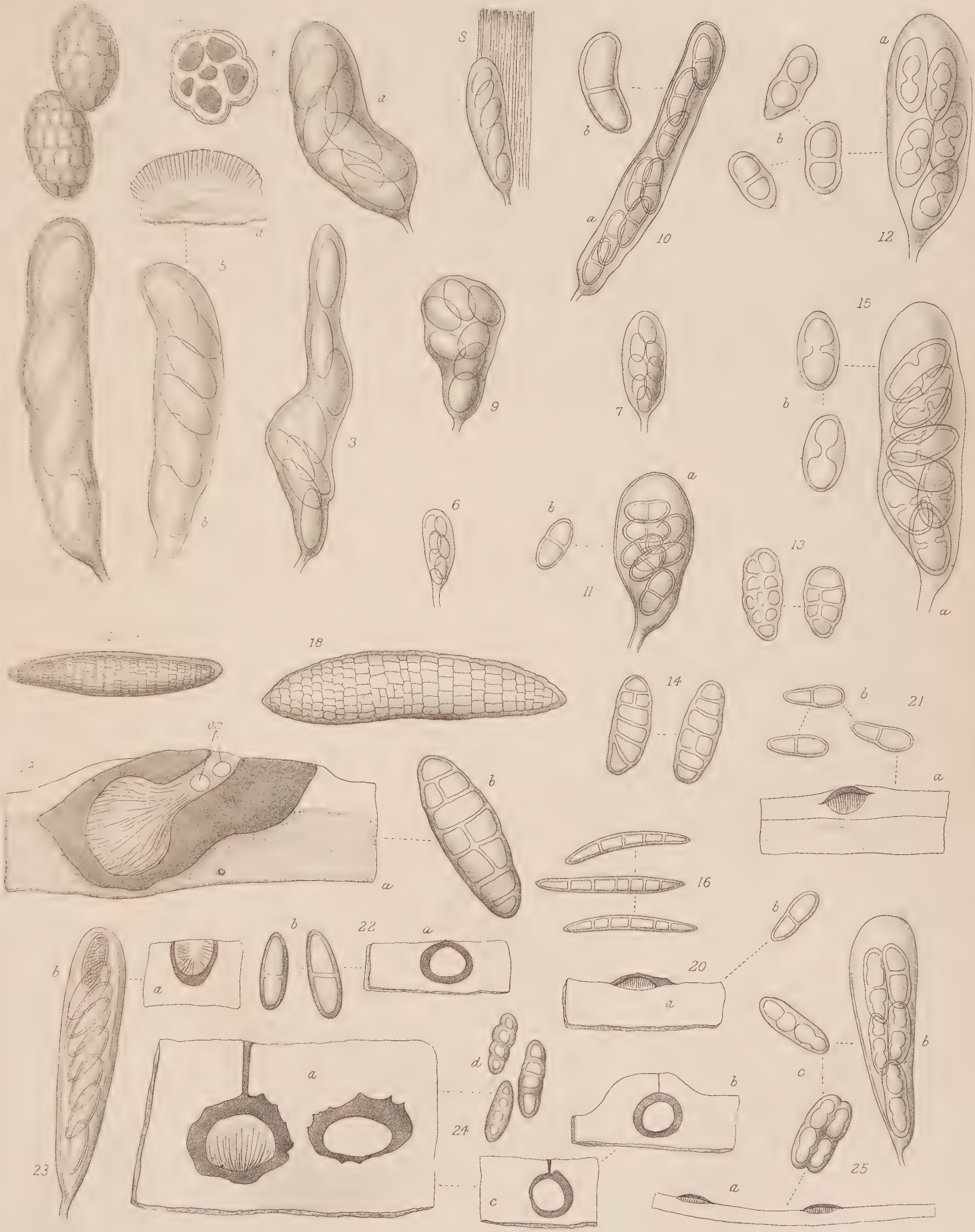
Differs from *P. gelidum*, Ach., in the darker non-lobate thallus, in the colour of the disk, and the thinner margin of the apothecia, and the dark brown hypothallus. *P. Rhuderi* has an albido-lutescent and lobate thallus, the disk of the apothecia atro-pruinose, and the spores not exceeding ·008 mm. in length.

PLACODIUM ARGILLACEUM, sp. nov. (Plate XXXVIII. fig. 14.)

Thallus cinereo-albus farinaceus *polline albo obsitus continuus indeterminatus.* Cephalodia carnea centrali radiatim rimosa. Apothecia urceolata disco *carneo*, margine *crasso* albo *farinaceo.* Sporæ in ascis elongato-cylindraceis uniserialiter octonæ ellipsoideæ, longit. ·016 mm., crassit. ·008 mm. Supra terram.

PLACODIUM LECANORINUM, sp. nov. (Plate XXXVIII. fig. 15.)

Thallus albido-cinerascens *continuus determinatus* arcte adnatus tenuis lævis v. subgranulato-pulverascens. Cephalodia copiosa *fusca* v. *fusco-atra* madefacta indistincte radiatim rugosa. Apothecia sordide carnea concava, margine albido interdum farinaceo, paraphysibus distinctis. Sporæ in ascis elongato-clavatis *obovatæ* 3-*septatæ*, longit. ·018 mm., crassit. ·006 mm., hyalinæ v. pallide luteæ. *Hypothallus pallide fulvus.* Ad lapides.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EXPLANATION OF THE PLATES.

[The whole of the figures in these Plates have been greatly magnified; but in his MS. the author has omitted to add the degree of enlargement of each object.—Editor.]

Plate XXXVII.

Fig. 1. Spores of *Urceolaria Novæ-Zelandiæ.*

Fig. 2. Ascus of *Pertusaria graphica.*

Fig. 3. Ascus of *Lecidea littoralis.*

Fig. 4. *L. subglobulata.* *a.* Ascus with spores; *b.* Squamule with apothecia.

Fig. 5. *L. subargillacea.* *a.* Section of apothecium; *b.* Its ascus.

Fig. 6. Ascus of *L. atro-morio.*

Fig. 7. Ascus of *L. sublapicida.*

Fig. 8. Ascus of *L. schistacea.*

Fig. 9. Ascus of *L. subcoarctata.*

Fig. 10. *L. subbadio-atra.* *a.* Ascus; *b.* A separate spore.

Fig. 11. *L. Whakatipæ.* *a.* Ascus; *b.* A single spore.

Fig. 12. *L. subtubulata.* *a.* Ascus; *b.* Spores in different stages.

Fig. 13. Spores of *L. petræa,* var. *Neo-Zelandica,* in different stages.

Fig. 14. Spores of *L. petræa,* var. *violacea.*

Fig. 15. *L. tubulata.* *a.* Ascus; *b.* Separate spores.

Fig. 16. Spores of *L. subfarinosa.*

Fig. 17. A spore of *Thelotrema saxatile.*

Fig. 18. A spore of *T. monospermum,* var. *patulum.*

Fig. 19. *Astrothelium pyrenastroides.* *a.* Section of apothecium, showing at *os* the ostioles of adjoining cells opening into common canal; *b.* A spore of same lichen.

Fig. 20. *Verrucaria gemellipara.* *a.* Apothecium in section; *b.* A spore.

Fig. 21. *V. minutissima.* *a.* Apothecium in section; *b.* Spores of same.

Fig. 22. *V. subbiformis.* *a.* Section of apothecium; *b.* Spores.

Fig. 23. *Bagglietto,* Mass.?, *ocellata,* Kn. *a.* Apothecium in section; *b.* Ascus of same lichen.

Fig. 24. *Verrucaria occulta.* *a, b, c.* Various sections of apothecia; *d.* Spores of same lichen.

Fig. 25. *V. pruino-grisea.* *a.* Section of apothecia; *b.* An ascus; *c.* Spores in different stages.

Plate XXXVIII.

Fig. 1. *Verrucaria dealbata.* *a.* Apothecium in section; *b.* Spores.

Fig. 2. *V. saxicola.* *a.* Apothecium in section; *b.* Ascus; *c.* A spore.

Fig. 3. *V. astata.* *a, b.* Sections of apothecia; *c.* Spores.

Fig. 4. *Porina endochrysa.* *a.* Apothecium in section; *b.* Two spores.

Fig. 5. *Chiodecton* (*Platygrapha*) *inconspicuum.* *a.* Vertical section, displaying several apothecia; *b.* Horizontal section of same; *c.* A septate spore.

Fig. 6. *Opegrapha saxicola.* *a.* Section of apothecium; *b.* Ascus; *c.* Spore.

Fig. 7. *Fissurina Novæ-Zelandiæ.* *a.* Apothecium in section; *b.* Portion of ascus.

Fig. 8. *Melaspilea metabola.* *a.* Section of apothecium; *b.* Ascus; *c.* Upper portion of ascus.

Fig. 9. *Phlyctis sordida,* its separate spores.

Fig. 10. *P. ocellata.* *a.* Two apothecia in section. *b.* Ascus; *c.* Five separated spores.

Fig. 11. *P. Neo-Zelandiæ.* *a.* Ascus; *b.* A paraphysis.

Fig. 12. *P. Neo-Zelandiæ,* var. *a.* An ascus; *b.* Septate spore of same.

Fig. 13. Ascus of *Placodium illitum.*

Fig. 14. Ascus of *P. argillaceum.*

Fig. 15. Ascus of *P. lecanorinum.*

XIX. *On some Points in the Morphology of the Primulaceæ.* By M. T. Masters, *M.D., F.R.S., F.L.S., &c.*

(Plates XXXIX.–XLI.)

Read June 7th, 1877.

THE most generally interesting points connected with the structure of the flowers of the Primulaceæ reside in the superposition of the stamens to the petals, the free central placenta, and the nature of the ovules.

Much discussion has taken place with reference to all these points. The explanation of the observed facts, and the arguments and inferences based upon them, have been derived from a study—

1. Of the comparative morphology of the genera of the order and of its allies.
2. Of the mode of development or organogenesis of the parts of the flower.
3. Of the minute anatomy of the flowers, and especially of the distribution of the vascular bundles within them.
4. Of the teratological phenomena observed in the order.

These latter are exceedingly numerous, and have consequently attracted the attention of a proportionate number of observers. It is to them that I propose to devote much attention in this paper, though I would deprecate the notion that teratological changes *per se* are to be taken as safe guides to the explanation of structure. The evidence they afford always requires to be controlled by that derived from other sources.

I must preface my remarks by stating that I have personally examined during the last twenty years a very large number of such instances, while my note-book teems with references to what has been published by others in this country and abroad.

It would be hardly possible to cite all these references, and certainly not desirable to do so; for many of them are, relatively speaking, of little importance to the matters I propose now to bring under the consideration of the Society. Such, for instance, are the malformations affecting the stem, leaves, or inflorescence, phenomena interesting in themselves, but which throw no special light on the structure of the order.

In passing, I may make allusion to the very great frequency with which deviations from the usual or, as it is called, typical structure occur in this group. As is well known to all who pay attention to these matters, malformations are much more common in some orders than in others. In the case of Primulaceæ a glance at the recorded literature will suffice to show how unstable, if I may so say, is the structure of certain genera of this order. Were it possible to enumerate individual cases, the fact would be even more prominently noticeable.

From the frequency with which these changes occur in such genera as *Primula* and *Cyclamen* it might be inferred that the changes induced by cultivation afforded sufficient reason for these structural aberrations. No doubt this is to a certain extent true. But

even among wild plants not subjected to cultivation the relative proportion of variously deformed Primulaceæ is decidedly large.

The common Primrose is, for instance, very subject to such changes, while the species of *Lysimachia* and *Anagallis*, which are comparatively rare in gardens, are so in a less degree.

Particular genera and even particular species are much more subject to these changes than others—the wild Primrose, for instance, as compared with the wild Cowslip. So in cultivation *Primula prænitens* (*P. sinensis*) is exceedingly liable to morphological disturbances, while *Primula cortusoides* and *P. japonica* are at present, according to my experience, but very slightly so.

It may be said, perhaps, that the varying conditions under which wild plants of widely extended geographical distribution grow may have some effect in determining these changes; but if so, they are not very obvious; for one may find a single patch of malformed Primroses growing amid a multitude of normal flowers, and apparently under like conditions. *Samolus Valerandi* has almost world-wide distribution; but it grows everywhere in similar localities; hence it is not surprising to find that, comparatively speaking, this species is not much subject to monstrous deviations from the typical structure. It is worthy of consideration whether this instability of form in certain species is connected with any change, either in the way of advance or retrogression—whether, in other words, it is in any way connected with the progressive development of an advancing type, or the gradual degeneration of a form destined to more or less speedy extinction. This, however, is a question upon which it is not my purpose to enter in this place.

I propose now to glance briefly at some of the more important changes which are met with in the plants of this order.

Calyx.—The most frequent deviations from the normal type of calyx consist in an enhanced degree of leafy development, or *phyllody*—a very common occurrence in the Chinese Primrose of gardens (*Primula prænitens*), and by no means uncommon in wild Primroses.

Sometimes the leafy character is associated with complete *dialysis* of the sepals, when there results a calyx of five free leaves, sometimes distinctly petiolate, as in the *Cyclamen* figured on the next page*. A minor degree of this change, that called "*virescence*," is also not uncommon. Here the parts of the flower are nearly unchanged in form and position, but are of a green colour.

A change of an opposite character is that wherein the calyx assumes the coloration of the corolla, the condition called "*calycanthemy*." This occurs in some long-cultivated varieties of Polyanthus, and has been made the subject of a special memoir by the late Prof. Morren†.

Corolla.—The teratological changes which occur in the corolla of Primulaceæ are of special interest in connexion with the notions entertained by morphologists as to its constitution. In most of the genera of the order the five petals of which the corolla consists form, at the base, a tube of varying length and diverse form, while above the five

* Masters, 'Vegetable Teratology,' p. 248.

† Bull. Acad. Belg. xix. part 2, p. 93.

segments are free. Attached to the corolla-tube, and superposed to its segments, are the five stamens.

In *Glaux* the corolla is wanting. In *Samolus* five scales emerge from the throat of the corolla, alternating with the stamens, which naturally suggests the notion that they represent an outer row of stamens, which in most cases is suppressed*. In a double-flowered *Cyclamen*† lately examined by me there was a double row of petals, the inner occupying the position of the scales of *Samolus*.

Others consider that the petal and the stamen are in this case not two distinct parts but two divisions of the same part. Thus Duchartre‡ describes the petals as appearing after the stamens as a sort of appendage or *dédoublement*:—"Elle (the corolla) ne constitue en effet dans l'origine qu'un bourrelet ou un petit repli qui entoure la base du verticille staminal." Van Tieghem §, basing his opinion on the fact that a common fibro-vascular bundle divides into an outer and an inner division, the former for the petal, the latter for the stamen, comes to the conclusion that stamen and petal form part of the same phyllome.

Cyclamen with leafy calyx, referred to in the text.

A similar conclusion is arrived at by Pfeffer‖ from the study of the development of the flower. He shows that within the calyx five small tubercles are developed, alternating with the sepals. Each of these tubercles ultimately develops into a stamen; and from the outer surface of this stamen is gradually protruded the petal. According to this view, then, the Primrose has, morphologically, no corolla, the petals being merely outgrowths from the stamens ¶.

Development of the Parts of the Flower.—My own observations on the development of the flowers of *Primula* and *Lysimachia* lead me to a slightly different conclusion. In the first place, the mode of development does not appear to be uniform in the same genus; thus in some specimens of *Lysimachia nummularia* it has appeared to me that the petals did really sometimes (but not always) precede the stamens in their development. When this happens the latter advance so much more rapidly that they speedily outstrip the petals, and appear as if they had preceded them. If this be really so, the petal, instead of being an outgrowth from the stamen, is, in such cases, the organ from which the latter proceeds (Plate XXXIX. figs. 10–23). Many double Primroses, in which petal succeeds petal, one in front of another, the inner bearing a stamen, support this view.

In normal Primroses the course of development, according to my observation, is as

* Eichler, Blüthen-Diagramme, p. 327.

† 'Gardener's Chronicle,' March 17, 1877.

‡ Ann. Sc. Nat. 1844, ii. p. 279.

§ Ann. Sc. Nat. 1867, ix. p. 135.

‖ Pringsheim, Jahrbuch für wissensch. Botan. 1871, viii. p. 194.

¶ Frank (in Jahrbuch, 1875, t. x. p. 204) also says that the petalline tubercles are at first not distinct from the stamens.

follows:—The rounded end of the receptacle gives off first of all five sepals in successive order. These attain relatively considerable dimensions before the five staminal tubercles which come next in order are simultaneously protruded (Pl. XXXIX. fig. 1) and alternately with the sepals (Pl. XXXIX. fig. 2). After the staminal tubercles have advanced somewhat—after, indeed, the antheral portion is separated from the filament, the tubercles which are to form the petals are protruded apparently from the back of the filament (Pl. XXXIX. figs. 3, 4). I say apparently, because what really takes place (in *Primula*) is this. After the formation of the staminal tubercles the thalamus pushes out the petalline tubercles, one at the very base of the outer surface of each of the filaments, and so close to it that it seems to arise from the filament itself; the receptacle, continuing to grow in the form of a tube (Pl. XXXIX. fig. 4), upraises the corolla-tube, and with it the stamens. While this is taking place the extreme apex of the receptacle is pentagonal and tabular in appearance, or slightly depressed in the centre (Pl. XXXIX. fig. 2). On its raised edge five small tubercles sometimes appear simultaneously, which are the carpels (Pl. XXXIX. fig. 5). These five tubercles are gradually raised from below by the lengthening of the receptacle in a tubular manner (Pl. XXXIX. fig. 6), so that we have soon a flask-shaped pistil with a narrow neck and open mouth (figs. 7 & 8). Within the rudimentary pistil so sketched out the receptacle changes its former flat or depressed condition for a convex or dome-shaped appearance; the middle portion of this dome speedily becomes covered with ovules from above downwards; the upper portion elongates into a naked cone; and the lower portion forms a stipes, which is apparently quite free from the walls of the pistil. Fig. 9 shows a plan of a vertical section through the flower at this stage. The neck of the pistil gradually lengthens into a style, becomes closed; and so we have ultimately the perfect ovary, with whose appearance every one is familiar *.

Chorisis.—Adverting now to the teratological appearances presented by the individual petals, it may be mentioned that the petals of Primulaceæ are frequently the subjects of *lateral chorisis* or fission. Slight instances of this are seen in the petals of the common Primrose, in the central notch by which they are characterized. If this subdivision be carried further we may have deeply bipartite petals, or fringed ones, as in *Soldanella*; and if the process be carried to an extreme, we have ten petals in the place of five, as is not uncommon in Primroses and *Cyclamen* † (Pl. XXXIX. fig. 10). This lateral branching of individual petals must not be confounded with the *dialysis* or complete separation of one petal from another, which has been observed in the flowers of *Anagallis* ‡ and other genera, and which is the normal condition in the genera *Asterolinum* and *Apochoris*.

Enation, or outgrowth from the surface of the petals, is a process scarcely distinguishable from transverse chorisis except by the later period at which it occurs. Chorisis, as I understand it, is a congenital process, beginning with the growth and continuing

* Quite as frequently, as far as I have observed in *Lysimachia* and *Primula*, the pistil originates as a ring, which grows upward from beneath so as to form a tube, upon whose edge the five tubercles are not formed till quite late in development, and in some cases, especially in monstrous flowers, not at all (Pl. XL. fig. 4).

† 'Vegetable Teratology,' p. 359.

‡ *L. c.* p. 73.

with the development of the organ affected (unless arrested), whereas enation does not show itself for some time after the origination of the part. Chorisis is a true subdivision of the original organ. Enation is a secondary process, and is, as its name implies, an outgrowth from an organ already advanced some stages in development. Such outgrowths are of frequent occurrence in Primroses; and they have especial significance with reference to the mode of formation of the stamens, before alluded to (Pl. XXXIX. figs. 2 & 3), and also to the formation of the placenta. It is curious to observe that in some of these cases the dorsal face of the outgrowth is applied to the upper surface of the petal from which it springs, just as the leaves of a book follow one another in parallel order, as in the diagram, where the thick line represents the outer surface of the petals, and the thin lines the inner surface respectively, while in other cases the upper surfaces are placed opposite one another, thus *. In the latter case it sometimes happens that the margins of the outgrowth adhere to those of the original petal, and a tube is formed. It must be understood that there is no real change of position in this latter case, such as could only be brought about by a twisting of the lower part of the outgrowth, but that the cellular structure characteristic of the outer surface is developed on the inner surface, and *vice versâ.*

A *tubular* or *cupped* condition of the *petals* is one of the commonest deviations in *Primula prænitens* †, the Chinese Primrose of gardens. It usually arises by a process of growth similar to that by which peltate leaves are formed; and as the marginal portions grow faster or more vigorously than the central ones, a cup or tube is eventually formed. In other cases the tube appears to be developed by the gradual incurvation and ultimate cohesion of the margins. It is possible that this latter condition represents the formation of the anther-lobes.

Adverting now to the principal malformations affecting the corolla of Primulaceæ as a whole, mention may be made of that general leafy condition known as phyllody or chloranthy, and which is frequently accompanied by prolification ‡. These changes will be incidentally referred to in the sequel. Another very common change consists in the duplication of the corolla. A "hose-in-hose" corolla is thus formed §. In such cases the petals of the inner corolla generally alternate with those of the outer; and then their autonomy may be safely assumed: but in other cases they are superposed; and then they are probably the result of enation, as before explained.

Andrœcium.—The commonest changes to which the stamens of Primulaceæ are subjected are various degrees of leafy or petaloid mutation, phyllody or petalody, as the case may be, such as have just been referred to, and, more rarely, of detachment from the tube of the corolla ‖.

Enation.—When what should be a stamen assumes a leafy or a petaloid condition it very often becomes subject to chorisis or to enation, in the same manner as in the

* Mast. in Journ. Roy. Hort. Soc. 1866, vol. i. new ser. p. 202; Veg. Teratology, pp. 377, 449.

† Veg. Terat. p. 315.

‡ See Marchand, Adansonia, 1864, p. 150; Baillon, Ann. Sc. Nat. sér. 3. t. 2, p. 290; Adansonia, iii. t. iv.; Bureau, Bull. Soc. Bot. Fr. x. p. 191.

§ Vegetable Teratology, p. 377.

‖ Ibid. p. 253.

case of the petals just referred to. (Pl. XXXIX. figs. 19 to 23 show illustrations of this character from a variety of Polyanthus known in gardens as the "Nigger.") In some of these cases enation takes place from both surfaces of the leafy or petaloid stamen (fig. 22), as may be illustrated thus , the central line indicating the axis of the staminode, the lateral ones the position of the outgrowth.

In some cases the flowers are still further complicated by the development of these supplementary outgrowths in the form of horns and tubes, either by cohesion of the margins, or by unequal growth and consequent depression of the centre, as before explained.

Pistillody of the Stamens.—Much the most interesting change, however, is that in which the stamens assume more or less of the condition of the carpels. The first case of the kind that fell under my own observation was nearly a quarter of a century ago, when I had the opportunity of inspecting a drawing and description of some flowers made by the Rev. G. E. Smith. His figures and his descriptions were so remarkable, that in my 'Vegetable Teratology' I confined myself to a mere mention of the case, and waited the time when, by the inspection of similar flowers, I might be able to form my own interpretation of the appearances presented. Mr. Smith's drawings bore every mark of accuracy; but I might well hesitate as to the correctness of the explanation given, when I read the following descriptions of the drawing:—"Stamen with anther sitting upon an imperfect petal and bearing a style; enlarged pollen with terminal style; anther bearing one long twisted style and stigma; stamen with pollen-cell proliferous, &c."

This was a description to whet the ardour of the humblest morphologist; but it was not till a short time ago, through the kindness of my friend Mr. Alfred Bennett, that I received from Miss Dowson, of Beccles, specimens evidently closely similar to those of the Rev. G. E. Smith, sufficiently so to vindicate the correctness of his drawings, and to supply an explanation of what was paradoxical in his descriptions. A comparison of the figures (Pl. XXXIX. figs. 24–32, which are copies from the drawings of the Rev. G. E. Smith), together with others taken from Miss Dowson's specimens by Mr. Worthington Smith and by myself, will show how close is the correspondence between the two sets of specimens (Pl. XXXIX. figs. 34–39, Pl. XL. figs. 1–3, and Pl. XLI. figs. 1–8).

No two of these flowers were exactly alike in all particulars; but there was so much general similarity between them in essential points, that it is not necessary to enter into details of particular flowers. The general appearances presented may therefore be briefly summarized as follows:—

Calyx normal. Corolla of a variable number of free, or nearly free, linear-oblong petals (Pl. XLI. figs. 1–3), the increase in number being obviously due to the fission or lateral chorisis of the original petals. This was seen by the fact of there being in some of the flowers, where the liberation of the petals was not complete, a short tube with five vascular bundles, each speedily dividing into two for the supply of the lateral subdivisions.

In the place of the normal stamens, but wholly detached from the corolla, were numerous free hypogynous pistillodic stamens, showing various degrees of transition between the conformation of the stamen and that of the carpel (Pl. XLI. figs. 4–7). The filamentary portion of these pistillodic stamens was, in some cases, but little changed; in other instances it was more or less dilated and leafy, and often crumpled or spirally twisted. In some the filament was dilated into an open carpel, destitute of ovules, but prolonged into a long style terminated by a stigma (Pl. XL. fig. 2). The ovarian portion was sometimes absent; and then the appearance was that of a style only (Pl. XL. fig. 3). In other cases the midrib of the filament or its central vascular bundle was thickened, and bore imperfect ovules (Pl. XXXIX. figs. 33–39). It is especially noteworthy that this placenta-like rib, while generally congenitally adherent to the leafy or carpellodic filament, was not unfrequently detached from it by chorisis, the significance of which fact will be further insisted on in the sequel.

In another series of these flowers the dilated filament was irregularly and pinnately lobed, the terminal lobe being incurved—a general occurrence, indeed, in the flowers in question. The uppermost of the lateral lobes very often bore marginal ovules, while the lower ones were infolded at the edges and prolonged into a long style and stigma (Pl. XL. fig. 1).

Here, then, we have a branched or divided carpellary leaf with some of its lobes open and others closed, both ovule-bearing. We have, in fact, the exact homologue of the so-called compound or branched stamen. The bearing of these facts on the nature of the free central placenta will be made apparent hereafter.

In the illustrations just cited it was the filamentary portion which was especially involved; but in another set of flowers the filament was unaffected or nearly so, and the changes were confined to the anther.

In the Rev. G. E. Smith's sketch the filaments were all normal, while in Miss Dowson's specimens they were usually more or less dilated. The changes observed in the antheral portion of the stamen, if stamen it can be called, were similar to those described in the case of the filament. Of anther, properly speaking, there was little or no trace, though the central placentary rib may be taken as the homologue of the connective, the latter prolonged occasionally into a style. In no case was I able to find any pollen at all. The ovules, indeed, occupy the situation of the pollen; but it could not be expected that there should be any transition between the pollen-cells and the ovules. Nor was I able to find, as I had hoped I might do, any trace of pollen in the ovules, as I have before seen in *Passiflora* and *Rosa*.

It should further be noted that the pistil in these flowers was quite normal *.

* Singular as these bisexual phyllomes are, they are relatively by no means unfrequent in certain plants, such as *Sempervivum tectorum*, *Cheiranthus cheiri*, and other plants mentioned in teratological records (see 'Vegetable Teratology,' p. 319). Even Conifers occasionally show similar phenomena. Thus, at the time of writing this paper, Mr. Syme, of the Elvaston Nurseries, sent me a catkin of *Cupressus Lawsoniana* in which the lower bracts were antheriferous and the upper ovuliferous; and, more than this, one of these bracts (Pl. XLI. figs. 9–11) bore on the outer surface, at the lower edge, an anther-cell, while on the inner face was a shortly stipitate ovule. Œrsted has recorded similar phenomena.

Gynæcium.—*Phyllody*, or leafy condition of the *pistil*, is of not infrequent occurrence in the Primrose. Imperfect development is also not uncommon, in which case an imperfect tube or sheath, open at the top without trace of style, surrounds the placenta, the latter being in such cases usually elevated on a long stalk (Pl. XL. fig. 4). This is in accordance with the natural development of the carpel, save that it is arrested. In other cases, especially in the Chinese Primrose (*P. prænitens*), the carpels assume a petaloid guise, the entire pistil being completely open at the summit (Pl. XL. figs. 8 & 9).

Dialysis, or a lack of union of the carpels, is of frequent occurrence in the Primrose, there being in the simplest cases five open carpels, each with its separate style and stigma. In a double Polyanthus lately shown at the Royal Horticultural Society, the calyx was normal, the corolla in two rows, the first row normal, with stamens as usual. Within them was a second corolla, also provided with stamens. The gynæcium consisted of five more or less detached petaloid open carpels, each with a long style and stigma. One of these carpels was remarkable for having its margins divided into lobes; of these lobes the uppermost were prolonged into styles (Pl. XL. fig. 11), the lower bore imperfect ovules; so that the same carpellary leaf bore secondary carpels and ovules, exactly as in the case of the pistillodic stamens previously mentioned (Pl. XL. fig. 1).

Placentation.—The free central placenta of Primulaceæ has naturally attracted much attention on the part of morphologists, some of whom have considered it to be of axial, some of foliar nature. The former view is that which is most generally adopted, though of late it has been contested by men of authority, on which account it may be well briefly to allude to the most important papers that have been published on the subject. A. de Saint-Hilaire * describes the placentas as originally connected with the interior of the style by a little thread, which is afterwards obliterated. Duchartre, in the paper before referred to, combats this view, and says that in the development of the ovary and the placenta "l'on remarque deux développements marchant parallèlement et simultanément; celui de la portion appendiculaire ou des parois de l'ovaire, du style et du stigmate, et celui de la portion centrale ou axile. Celle-ci pendant toute la durée de son développement reste libre et indépendante de la partie externe du verticille femelle; elle joue absolument le rôle d'un petit rameau végétant sous un abri protecteur, le seul rôle du reste qu'elle puisse jouer. D'abord entièrement homogène elle se laisse diviser plus tard en deux parties, l'une inférieure, qui donne naissance aux ovules et qui possède toute la structure de l'axe lui-même, l'autre supérieure et stérile uniquement celluleuse, dont le développement est, le plus souvent, très-borné, qui parfois s'accroît . . . et devient un petit cône logi dans la partie inférieure du canal stylaire."

Payer † entirely adopts the conclusions of Duchartre, as, indeed, do most modern observers.

A large number of teratological phenomena might be cited in favour of this view, such as the instance cited by Duchartre in which a flower-bud was observed at the apex of the placenta in *Cortusa Mathioli*. Other prolifications of a similar character have been

* Mémoire sur les plantes auxquelles on attribue un placenta central libre (1816).

† Organogénie Végétale, p. 611.

recorded by Marchand and others. Baillon * even mentions a species of *Lysimachia* in which the placenta was prolonged beyond the ovary in the form of a shoot bearing leaves, and which was cut off and struck as a cutting.

Alphonse de Candolle and many others have noticed the placenta giving off leaves instead of ovules.

In double Primroses it is not unusual to find the placenta bearing ovules at its lower part and one or more carpels above (Pl. XL. figs. 12–15)—a condition which has its parallel in the singular instance described by Mr. Berkeley in a species of *Dianthus* †. Such instances as those just alluded to support the view that the placenta is an axial structure; nor is that notion necessarily invalidated by the very common occurrence of free central, marginal, and parietal placentation, with every intermediate state, in the ovaries of double Primroses; for the presence of ovules, as of buds, is of itself no proof either of the foliar or of the axial structure of the organ from which they spring.

There are, however, many valid reasons for supposing the placenta to be of foliar origin: thus Van Tieghem ‡, who at one time considered the placenta of Primulaceæ to be the direct prolongation of the axis (Ann. Sc. Nat. 5e sér. 1868, t. ix. p. 211), is now satisfied that the vascular bundles of the placenta have their spiral vessels on the outer side, and that they are therefore appendicular. On the other hand, he admits that in cases of virescence or prolification, the axial system of the pedicel is abnormally prolonged into the cavity of the carpels. In this latter case the tracheæ are internal. The vascular bundles of the placenta then, instead of being independent of the carpels, are offshoots from them. A similar conclusion is arrived at with reference to *Theophrasia*.

In a note appended to p. 622 of his translation of Sachs's 'Lehrbuch,' M. Van Tieghem gives the following summary of his present views, which it is convenient to cite in this place.

"L'étude anatomique démontre que le pétale et l'étamine superposés (Primulaceæ), ne sont que les deux parties d'une seule et même feuille ramifiée, qui a subi une métamorphose hétérogène et double appropriée à deux fonctions différentes. Mais, en outre, elle fait voir que la colonne placentaire est formée, non par le prolongement de l'axe floral au dessus de l'insertion des carpelles, comme on l'admet généralement, mais par des dépendances liguliformes des carpelles qui constituent la paroi de l'ovaire unies et soudées entre elles dans l'axe géométrique de la fleur comme les carpelles le sont eux-mêmes latéralement dans toute leur étendue. De sorte que les ovules sont ici, aussi, insérés en définitive sur la feuille carpellaire, et qu'ils ont par conséquent la valeur morphologique de lobes de feuille"§.

Al. Braun ‖ held somewhat similar views to Van Tieghem's, and pointed out that many cases in which the placenta appears to be axial may be explained by the congenital detachment of the bases of the carpellary margins and their fusion one with another

* Baillon, 'Adansonia,' iii. p. 310.

† Gard. Chron. Sept. 1850, p. 612, and Veg. Terat. p. 268.

‡ Ann. Sc. Nat. 5e sér. t. xii. p. 329 (1871); 'Recherches sur la structure du pistil' etc. p. 91.

§ Trécul, however (Comptes Rendus, Oct. 23, 1876), contests Van Tieghem's views, and shows that in *Anagallis* the vessels of the placenta originate independently of and *before* those of the walls of the ovary. The parietal and placental vessels do not correspond in number; nor are they continuous with, but quite free from, those of the thalamus.

‖ Analysis in Bull. Soc. Bot. France, Rev. Bibl. (1875) t. xxii. p. 63.

in a line continuous with the floral axis, although he admitted that in Primulaceæ there are grounds for supposing the placenta to be truly axial *.

The appearances presented by the double Primrose sent by Miss Dowson substantiate the view of Van Tieghem, that the placenta is derived from the carpellary leaf by chorisis (Pl. XXXIX. figs. 34–38). In the specimens in question the placentas are sometimes marginal, at other times parietal, the placenta in this latter case being homologous with the midrib of a carpellary leaf, and not unfrequently detached from it, sometimes slightly, at other times completely (Pl. XXXIX. figs. 37, 38). Double-flowered Primulaceæ in fact frequently furnish illustrations of free central, axile, marginal, and parietal placentation (Pl. XL. fig. 16). Moreover they show that in some cases the placenta, whatever its position, is a mere outgrowth from the carpellary leaf, capable of becoming completely detached from it, and in that case simulating an axis.

In a malformed Cowslip, a figure of which is given (Pl. XL. figs. 17–20), among other changes the pistil was broken up into its five carpels, each with its style and stigma. In the centre of the flower was a mass of threads or funicles, each surmounted by an imperfect ovule. Some of these threads evidently sprung from the inner surface of the carpels, others from the margins, while the majority were quite detached from the carpellary leaf.

In the normal flower this detachment must take place, if at all, at a very early period, and the placentary ribs of one carpel may become united to those of another, and so, at length, a free central placenta may be formed. If the axial appearance of the placenta and the five vascular bundles visible in it be cited as proof of its axial nature, it may be pointed out that five petioles, each with a single vascular bundle and united together, would give an appearance of an axis.

For my own part, I look on the alleged distinction of axial and appendicular organs as one of convention, desirable to be kept up for descriptive or classificatory purposes, but altogether of secondary importance from a morphological point of view. The occurrence of leaf-buds or flower-buds on the placenta, such as have been recorded in various monstrous Primulaceæ, therefore has not for me the same degree of significance that it has for those who look upon their presence as indicative of the axial nature of the organs bearing them. Leaf-buds, flower-buds, and roots may and do arise from leaf-organs or phyllomes, as they do from caulomes, and they cannot be looked on as absolutely characteristic of either †.

* In the female flower of an Alder (*Alnus*) sent to me by Mr. Stratton, among other changes, the ovules were borne on a stalk standing up free in the centre of a one-celled pistil, forming a free central placenta. It seemed probable that in this case the stalk was composed of the detached dissepiments of the ovaries.

† As I write I have before me a flower of *Calochortus* sent me by Mr. Burbidge, in which the filament of the stamen bears at its junction with the anther a well-marked bud (Pl. XL. fig. 21). These adventitious buds are sometimes veritable enations; at other times they are borne on stalks which are congenitally adherent to to the leaf-organ. See Planchon, "Quelques mots sur les inflorescences epiphylles," Mém. Acad. Stanisl. 1862, p. 403; Caspary, Schrift. phys.-œkon. Gesellsch. zu Königsberg, 1874. Still more germane to the subject now under consideration are those cases in which the placenta bears leafy ovules, as happens occasionally in Crucifers. In a species of *Triumfetta*, and in one of *Corchorus*, I have seen a similar arrangement, the latter case (Pl. XL. figs. 21–24) being particularly interesting from the position of the leafy ovules on the midribs of the carpels (parietal), not on the margins.

So far, then, as the nature of the placenta is concerned, we have two theories: according to the one it is essentially axial; according to the other it is foliar. Organogenetic evidence is strongly in favour of the axial view, though it is quite clear that, had it been practicable to observe the mode of development of the monstrous Primroses above described, the foliar nature of their placenta would have been proportionally as obvious as in the adult state.

The evidence derived from minute anatomy is conflicting; and it is doubtful whether so much importance should be attached to the position of the vascular bundles and of their constituent elements as Van Tieghem is disposed to attribute to them.

Comparative morphology is entirely in favour of the axial view; there is not, so far as I am aware, a single genus of Primulaceæ or of Myrsinaceæ where, under normal circumstances, the placenta is any thing else but "free central."

Teratology, as we have seen, affords support to either view, and lands us in this dilemma. Either we must say that any or all forms of placentation, foliar and axial, may occur in Primulaceæ—a conclusion to which morphologists would certainly demur, except as a monstrous condition; or we must admit that the evidence afforded by teratology is utterly worthless in deciding such cases, and that the appearances in question are, in fact, simply accidental and abnormal. To this latter conclusion equally strong objection may be taken. Extraordinary as these appearances sometimes are, they may generally be easily referred to ordinary morphological laws. If this be admitted, as it must surely be by any one who has paid any attention to the subject, then we are sent back to the morphological dilemma above mentioned.

As a provisional means of dealing with it, it may be suggested, as an hypothesis, that the stock from which Primulaceæ descended had parietal placentation, but that in course of time the placentas have become detached from the walls of the ovary, and fused together to form the free central placenta. Looked at in the light of this hypothesis, the monstrous flowers above alluded to, showing every gradation between carpellary and axial placentation, are mere reversions to an ancestral form.

For this hypothesis it must be admitted no evidence can be adduced beyond that of the monstrosities in question and the occasional presence of a little filamentous process (the *filet* of St.-Hilaire) connecting the placenta with the apex of the ovarian cavity—a process the existence of which is doubted by Duchartre, but which is nevertheless occasionally to be seen on making sections of young Primulaceous ovaries, and which is, on this hypothesis, to be explained as a rudiment of the process of chorisis, by which the former generations of Primroses changed their parietal for a free central placenta.

Ovules.—From the ordinary appearance of the placenta in Primulaceæ, and the position of the ovules upon it, it might well be supposed that the ovules or, rather, their outer coats were independent of the carpels, and direct outgrowths from an axial placenta, each ovule being the representative of a distinct leaf or phyllome. The cases recorded by Unger, Alphonse deCandolle, Brongniart, Marchand, Cramer, and others *,

* Vegetable Teratology, p. 263.

may almost all be alleged in support of this view. Nevertheless, when the evidence thus presented us is analyzed a little carefully, and correlated with the facts revealed to us by anatomy and development, it will be found that in most cases the facts related are not incompatible with the notion that the placenta is essentially an outgrowth from the carpellary leaf, and, by consequence, that the ovules, or their outer coats, are also derivatives from that source. Although the question, whether the ovular coat be a direct formation from the axis, or whether it originates from the carpellary leaf, may still be said to be undecided, yet the foliar character of the ovular coat will hardly now be contested. To the establishment of this point the investigations of monstrous Primroses by Brongniart and others * have mainly tended. It is not necessary to do more than recall these observations, because their accuracy has never been called in question. The illustrations now brought forward show clearly that the ovules of these particular Primroses are processes from the carpellary leaf, either marginal or detached by chorisis from its centre. This is in accordance with the views of Van Tieghem as cited in the extract previously quoted. The occurrence of secondary carpels on the placenta, mixed with the ovules, also confirms this view. In this latter case we have a branched or compound carpel, some of the lobes of which are developed as ovules, others as secondary carpels.

These remarks, of course, apply to the outer coat of the ovule, and not to the nucleus. None of the monstrous flowers of Primulaceæ that I have hitherto examined have given any clue to the nature of the nucleus.

Summary.—Taking now a general review of Primulaceous structure, normal and abnormal, the facts cited seem to lead to the following conclusions:—

1. That the petals of most Primulaceæ (not in *Samolus* or *Androsace*) are late outgrowths from the receptacular tube outside the stamens, and posterior in development to them, but upraised with them by the upward growth of the so-called tube of the corolla.

2. That the placenta of existing Primroses is a direct prolongation of the receptacle or axis, without any connexion with the sides or apex of the carpels.

3. That the placenta in some (monstrous) flowers is an outgrowth, either from the margin or from the centre of the carpel, such outgrowth occasionally becoming wholly detached, the detached placentas, moreover, sometimes cohering one with another, and thus producing the appearance of a solid column directly prolonged from the receptacle. Such forms of placenta lead to the inference that the ancestral progenitors of Primulaceæ had parietal placentation, the monstrous forms being, on this view, looked on as reversions.

4. That both staminal and carpellary leaves may occasionally be divided or lobed, so that just as we meet with compound or divided stamens in Malvaceæ and other orders, so the carpels of some orders are the homologues of divided leaves, as first pointed out by Prof. Dickson.

5. That the ovular coat of Primulaceæ is essentially foliar, representing either the

* See specially Brongniart, Ann. Sc. Nat. 2e sér. t. i. 1834, p. 308, and Ann. Sc. Nat. 3e sér. t. xi. p. 20 (1844); Cramer, Bildungsabweichungen (1864).

blade (or dilated leaf-stalk) of an undivided leaf, or, in other cases, a lobe or process of the carpellary leaf, and not a direct production from the axis (assuming, for descriptive purposes only, a distinction between axis and appendage).

6. That the processes or lateral lobes of the carpellary leaf may be infolded, in some cases, so as to form secondary carpels.

Select Bibliography.

The following are among the principal works and memoirs relating to the structure of Primulaceous flowers, and which have been consulted in the preparation of these notes:—

Duchartre, "Observations sur l'organogénie de la fleur &c. chez les plantes à placenta central libre." Ann. Sc. Nat. 3e sér. tome ii. (1844) pp. 279. *Cortusa Mathioli*, "Flower on apex of free central placenta."

Brongniart, Ann. Sc. Nat. 2e sér. tome i. p. 308, t. ix., and 3e sér. tome ii. (1844) p. 20.

Babington, C. C., Ann. Nat. Hist. 1844, p. 464. *Primula vulgaris.* In place of the ovary a cup-shaped body, from the centre of which springs a cylindrical column, bearing a cup-like sheath, or imperfect ovary at the top, surrounding a conical placenta studded with ovules.

Alphonse de Candolle, Neue Denkschriften, Band v. p. 9. General phyllody of flower of *Primula auricula*, leafy condition of ovules, &c. *P. prænitens*, flowers within the ovary, &c.

Baron de Melicoq, Ann. Sc. Nat. t. x. 1846. Prolification of inflorescence, &c.

Unger, Act. Acad. Nat. Cur. 22, ii. (1850) p. 543, t. 5 & 6; Bot. Gazette, May 1851, p. 70. *Primula sinensis*, phyllody of the parts of the flower, &c.

Payer, Organog. p. 611, t. 153 (1857).

Masters. *Primula sinensis* (March 1859). Pistil entirely wanting; in place of it an umbel of about six rays, each bearing a small flower-bud.

Cramer, Bildungsabweichungen, p. 132 (1864).

Masters, Vegetable Teratology, 1869. In this volume a large number of references are given to various malformations recorded by various observers or by the author.

Cave, "Sur le placenta central libre des Primulacées" (analyzed in Bull. Soc. Bot. France, xvii. 1870, p. 110, Rev. Bibl.). The author supports the axial nature of the placenta on anatomical grounds. If, says M. Cave, the spiral vessels are on the inner side of the generating layer, the organ is axial, and *vice versâ*.

Faivre, Sur l'ovule et sa nature morphologique chez le *Primula sinensis*. Pamphlet, analyzed in the Bull. Soc. Bot. France, lxvii. (1870), Rev. Bibl. p. 90. The ovule is considered to be homologous with a leaf. the funicules = petiole, the ovular coat = the lamina. See also Bull. Soc. Bot. Fr. 1869, p. 127.

Clos, Essai de Tératologie Taxinomique (1871), p. 20. In this are cited the teratological records relating to the Primulaceæ, extracted from various publications issued since the date of Moquin-Tandon's classic work, 'Eléments de Tératologie Végétale' in 1841.

Pfeffer, "Zur Blüthenenttwickelung der Primulaceen," Pringsheim's Jahrbuch, viii. p. 194.

Van Tieghem, "Structure du pistil des Primulacées," &c., Ann. Sc. Nat. 5e sér. tome xii. (1871) p. 329.

J. L. de Lanessan, "Sur le développement des faisceaux fibro-vasculaires dans les organes floraux des Primula," Bull. Soc. Linn. Par. No. 4, Nov. 1874. Shows, with Trécul, that the fibro-vascular bundles are late formations in comparison with the cellular tubercles in which the several organs of the flower begin.

Braun, Verhandl. des bot. Vereins der Provinz Brandenburg, 1874, p. 45.

Celakovsky, Flora, 1874, p. 170; and Vergleichende Dartstellung der Placenten in den Fruchtknoten der Phanerogamen, 1875. Placenta of Primulaceæ considered to be axial.

Eichler, Blüthendiagramme (1875), p. 327. Considers that the outer row of stamens is abortive, the inner congenitally united with the petals. The placenta is considered axial, and the ovules foliar.

Morren, C., Bull. Acad. Roy. de Belgique, t. xix. No. 8, p. 539, c. tab.: *Primula prænitens*, virescence and phyllomorphy of flower. Bull. Acad. Roy. de Belgique, xix. p. 97, c. tab.: calycanthemy.

DESCRIPTION OF THE PLATES.

Plate XXXIX.

Figs. 1–9 *inclusive represent various Stages in the Development of the Flowers of* Primula japonica. The figures are all highly magnified.

Fig. 1. The young flower, seen from the side, with its bract *b*; *c*, the calyx; *st*, the staminal tubercles.

Fig. 2. Flower, seen from the top. The calyx is formed, and also the staminal tubercles, but no petals or pistils.

Fig. 3. View of a fragment of a flower, showing three sepals and two stamens, with indications of the petals, *p*, at their base.

Fig. 4. Side view of a flower rather further developed. The sepals are removed; the staminal tubercles, *st*, are shown, with the petals, *p*, and the commencement of the corolla-tube.

Fig. 5. Portion of a flower still further developed, seen from within, and showing three staminal tubercles and the commencement of three carpellary tubercles, *c*.

Fig. 6. Fragment of a flower in a further stage of development. Three carpels are shown free above, but congenitally coherent below; the placenta, *pl*, is already formed in the shape of a dome-shaped mass, studded towards the base with ovules, which develop from above downwards.

Fig. 7. Section of the young pistil of another flower, with the placenta, *pl*, not yet producing ovules, although the development of the pistil is further advanced than in the preceding.

Fig. 8. Pistil in a further stage of development, and nearly closed.

Fig. 9. Diagrammatic section of a flower with sepal (*s*), stamen (*st*), petal (*p*), carpel (*c*), and placenta (*pl*), all formed, and the upraising of the so-called corolla-tube just begun.

Figs. 10–23. *Illustrations of Chorisis and of Enation in the petals and stamens of* Primula vulgaris *etc.* All slightly enlarged.

Fig. 10. Lateral chorisis of the petals; the venation at the base shows that each of the original vascular bundles destined for the petals is split into two divisions.

Figs. 11–16. Enation; various outgrowths from the petals. 16. Section showing plan of arrangement of parts in fig. 15.

Fig. 17. Supernumerary petals in *Primula Auricula*. Fig. 18. Sectional plan of the same.

Fig. 19. Stamen of *Primula vulgaris*, with a petal growing from it, and two supernumerary petaloid outgrowths, developed in the order shown by the numerals (i. ii. iii. iv.) in fig. 20.

Fig. 21. Petal of *Primula vulgaris*, with petaloid anther. Fig. 21 *a*. Similar anther detached.

Fig. 22. Petaloid stamen of a variety of Polyanthus, "the Nigger," developing from either side, by enation, secondary petaloid laminæ in the order in which they are numbered (i. to v.). Fig. 23. Plan of the same, the Roman numerals corresponding.

J.N.Fitch lith.

FLORAL CONFORMATION OF PRIMULACEÆ

Fitch imp

J.N.Fitch lith. FLORAL CONFORMATION OF PRIMULACEÆ, *etc.* Fitch imp

Figs. 24–32. *Copied from drawings by the Rev. G. E. Smith of monstrous flowers of* Primula vulgaris.

Figs. 24, 25. Flowers, seen from the side: nat. size.

Fig. 26. Flower, natural size; sepals and petals turned down to show the hypogynous pistillodic stamens and the normal pistil.

Fig. 27. Normal pistil, with hypogynous petal, attached to which is a pistillodic stamen: magnified.

Fig. 28. Pistillodic stamen from 26, magnified, showing a filament, a dilated anther bearing rudimentary ovules in the centre and at the margins and with a terminal style.

Fig. 29. Pistillodic stamen with ovules, and three secondary carpels with styles.

Fig. 30. Back view of the same, the styles cut across: magnified.

Fig. 31. Filament with pistillodic anther, from the side: the margins bear ovules; and the apex terminates in a style.

Fig. 32. Filament with pistillodic anther, with abortive ovules and terminal style.

Figs. 33–38. *Pistillodic Stamens from* Primula vulgaris, *taken from the flowers shown in* Plate XLI.: all slightly magnified.

Fig. 33. Pistillodic stamen, with apex infolded, and with central placentary rib bearing ovules. In other cases this rib was quite detached.

Fig. 34. Section of preceding.

Fig. 35. Similar stamen to 33, with detached filamentous outgrowth.

Fig. 36. Another specimen, placental rib quite detached except at the base.

Fig 37. Section at upper portion.

Fig. 38. Section at lower portion.

Plate XL.

Figs. 1–3. Primula vulgaris, *from Miss Dowson's specimens* (magnified).

Fig. 1. Pistillodic stamen irregularly pinnately lobed, terminal lobe infolded, lateral lobes some destitute of ovules, others ovuliferous on one or both margins; lowermost lobe infolded so as to become a secondary carpel, with ovules on its margin, and its apex prolonged into a style; from the centre emerges a placentary rib bearing an imperfect ovule.

Fig. 2. Pistillodic stamen, in the form of an open carpel, with ovary, style, and spatulate stigma, but destitute of ovules.

Fig. 3. Pistillodic stamen represented by a spiral style only.

Figs. 4–16 *show Leafy or Petal-like Condition of Pistil etc.*

Fig. 4. Leafy pistil laid open, taken from a virescent Primrose, magnified. The pistil, owing to arrest of development, was in the shape of a tube open at the top. The placenta is seen above the orifice of the tube of the pistil raised on a long stalk, and covered by imperfect stalked ovules.

Fig. 5. Section of upper part of placenta of the same.

Figs. 6 and 7. Abortive ovules from the same.

Fig. 8. Petalodic pistil of *P. vulgaris* open at the top, and cut down the side to show the placenta: magnified.

Fig. 9. Similar pistil from *P. prænitens*. The free edge of the petaloid carpels is here fringed; the surface bears a few imperfect ovules (parietal placentation) in addition to the free central placenta.

Fig. 10. Extremity of placenta from the same flower, enlarged, and with some of the ovules removed to show the apex of the placenta giving off thickened funiculi destitute of ovules.

Fig. 11. Open carpel of Polyanthus, showing carpel lobed at the sides—the lobes being, some of them ovuliferous (*ov*), others prolonged into styles, as is also the apex: magnified.

Fig. 12. Placenta bearing ovules (one of which is detached and enlarged at fig. 13), and a carpel with a long style and spatulate stigma.

Fig. 14. Placenta with ovules removed to show the carpel.

Fig. 15. Base of carpel.

Fig. 16. Pistil of *Primula prænitens,* showing marginal and free central placentation, and dialysis of four styles: magnified.

Figs. 17–20. *Virescent Cowslips etc.*

Fig. 17. Flower of Cowslip, *Primula veris.* Petals virescent, stamens imperfectly developed, pistil dialyzed, ovules represented by thread-like funicles bearing abortive ovules.

Fig. 18. Section of a similar flower.

Fig. 19. Diagram showing the dialysis of the carpellary leaves and the position of the abortive ovules in figs. 17 and 18.

Fig. 20. Section of normal ovary with free central placenta.

Figs. 21, 22. *Calochortus,* sp.

Figs. 21, 22. Front and back views of a petaloid stamen of *Calorchortus,* sp. The anther is petaloid; and at the junction with the filament is a bud, three leaves of which are petaloid, unfolded, and spreading; the others, smaller, are still undeveloped. (Drawn by Mr. Burbidge.)

Figs. 23, 24. *Corchorus,* sp.

Fig. 23. Flower of *Corchorus* with five sepals, the petals and stamens removed to show the stalked ovary.

Fig. 24. Ovary laid open, to show leafy ovules on dorsal and ventral sutures of carpels.

Plate XLI.

Figs. 1–8. Primula vulgaris *with pistillodic stamens* (*Miss Dowson*), *drawn by W. G. Smith, Esq., F.L.S.* All magnified.

Fig. 1 shows a longitudinal section, with numerous hypogynous pistillodic stamens, the filaments leafy or petaloid, the anthers ovuliferous in the middle, and the connectives prolonged into a two-lobed incurved petaloid lobe. The central pistil is normal, with a long style.

Figs. 2–3. Sections of similar flowers. The apices and sometimes the lateral lobes of the pistillodic stamens are prolonged into styles terminated by stigmas.

Fig. 4. Pistillodic stamen from one of the above flowers. Filament dilated; anther open, ovuliferous in the centre; connective petaloid, two-lobed.

Figs. 5–7. Similar stamens to fig. 4.

Fig. 8. Pistillodic stamen reduced to a style with terminal spatulate stigma.

Figs. 9–11. *Cupressus Lawsoniana.*

Fig. 9. Back or outer surface of bract with anther-lobe at lower edge.

Fig. 10. Front of the same bract, with a single ovule raised on a short stipes. The usual ovuliferous scale is abortive, so that the ovule appears to arise directly from the base of the bract.

Fig. 11. Longitudinal section through the bract, to show the position of the anther and of the ovule: *a,* anther; *br,* bract; *o,* ovule.

4
3
5
8
7
9
br
o
11
a
10
2
6
1